TRANSACTIONS

OF THE

HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND.

JULY 1843—MARCH 1845.

NEW SERIES.

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CONTENTS.

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OF THE

HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND.

PRELIMINARY NOTICE.

While the beneficial effects of the operations of the Highland and Agricultural Society of Scotland have been generally acknowledged throughout this kingdom, and in no inconsiderable degree also in England and Ireland, a feeling appears to have arisen, and gradually gained strength, that something was required by a great proportion of its Members, particularly those resident in the country, towards the establishment of a more immediate connection with, and more intimate knowledge of, the business of the Association, as carried on in Edinburgh. It was stated, at a late general meeting, that the Members almost universally felt and complained that, beyond the general and local shows, and the accounts of the proceedings of the half-yearly general meetings, which are published in the newspapers, they remained in ignorance of the operations of the Society, and, consequently, could not take that interest in its affairs which they otherwise would do; and that this feeling operated as a bar to many gentlemen residing in the country, especially farmers and practical agriculturists, becoming members. It was accordingly proposed, as a remedy for this evil, of which the existence seemed to be pretty generally acknowledged, that the Society, in imitation of various other bodies of a similar nature, should publish their own transactions, and furnish them gratuitously to its members; and it was remitted to the Directors to consider and report whether it would be practicable or advisable for the society to adopt this proposition; or whether any means could be devised for publishing them, as at present, in connection with the Quarterly Journal of Agriculture, but at a reduced price.

The Directors immediately entered on the serious and anxious consideration of this very important subject. It appeared to them that, though the Society's Transactions were not, indeed, published in the manner usual with many other societies, nor distributed gratuitously, the most important, and generally useful and practical part of their papers and prize essays, were given to the public in connection with the Quarterly Journal of Agriculture—a work generally admitted to be a highly useful and valuable record of the state and progress of agricultural knowledge, comprising much important information which the Society could not command, and known as a standard work indispensable to the library table. Under the arrangements which had been made by the Society with the publishers, when the Journal was originally established, the Society's papers were printed free of expense, excepting a small sum annually to an editor, and the cost of plates for engravings illustrative of the geological surveys. The Society, thus relieved of the expense of publication, had been enabled to devote its whole available funds to encouraging improvement in the breeds of the domesticated animals connected with agriculture; improvements in all the departments of farming; reclaiming waste lands; for essays and reports; and, in short, for that extensive catalogue of useful objects which the annual prize lists contain, and which the general and local shows every year, and every where, exhibit. Nor must the Society's Museum be omitted—an institution which, connected with its monthly meetings, and the regularly published abstracts of their proceedings, cannot fail to be of the greatest public benefit, and to afford, in some degree, that connecting link between the managing body of the Society and its absent members which has been considered to be so desirable.

It was evident to the Directors, and must now be equally clear to the body of the Society, that the transactions could not be published in a separate and independent form, and issued gratuitously, without either, on the one hand, calling for an additional annual subscription—the success of which would be extremely doubtful, and attended with many difficulties—or, on the other, without greatly curtailing the scale of premiums, which, the Directors are satisfied, no member of the Society would desire to recommend. But, independently of the great additional expense, and the disadvantages of severing the connection with the Quarterly Journal, the Directors were satisfied that their materials, though valuable and highly creditable to their authors generally, would fall greatly short of that which would be required for maintaining a periodical publication in a style worthy of the Society.

In the course of the negotiations with the publishers, it soon

became apparent that some change in the form and price of the Journal was required. Its circulation in Scotland was found to be much too limited; and this the Directors could only attribute to its high price, and, in some degree, to its bulk. It was not without disappointment that the Directors found that, in so far as respects the general diffusion of agricultural knowledge, their efforts had been less successful than they had desired. While seeking a remedy for this state of things, as applicable to the Society's own members, the Directors did not overlook the interests of the public at large. On a careful consideration of the list of the Society's members, it became evident that an exceedingly small proportion of the farmers of the country were enrolled in it, and this led to the conclusion that, whatever steps the Directors might adopt towards attaining a cheaper form of the Quarterly Journal and Transactions for the Society's own members, it would be quite at variance with the uniform principle of action which guides the society, to neglect the interests of so large a proportion of agriculturists as was comprised in the lists of the local agricultural societies throughout the country. In the farther prosecution of the subject, therefore, the interests of these associations were made to blend with those of the Society's own members.

It appeared that, if the Quarterly Journal of Agriculture and the Transactions of the Society were somewhat reduced in bulk, and a certain number of copies taken by subscription, the price might be reduced very considerably to the Society's members —a privilege to which they were entitled, in consideration of the expense incurred in premiums for papers, in preparing these for the press, and in plates, all which items were a saving to the publishers. The price, thus modified, would not exceed two shillings for each number, instead of the former price of five shillings; and the copies of the work would be delivered to subscribers in the manner most convenient to them, or, at least, would be delivered at the principal towns in all the important districts of Scotland. The publishers very liberally acceded to the proposal for extending the privilege to all members of local agricultural societies and farmers' clubs in Scotland in connection with the Society. No pains, trouble, or expense were spared by the Directors in giving furtherance to the important object in view, and the result has been, that a very large proportion of the Society, and a considerable number of members of local societies, have subscribed—quite sufficient to permit of the arrangement being put in operation; and the Directors have no doubt that the new Journal, with its advantages of cheapness, condensation, and facility of delivery, will speedily acquire a very widely extended circulation, not only in Scotland amongst the Society's members and local connections, but with the public in general; it being

part of the arrangement, that the selling price to the latter shall likewise be reduced, though not in the same degree.

The number to which these observations are affixed, in the way of introduction, forms the first of the New Series, and the Directors fully anticipate that this series will form an important era in the history of agricultural literature and science, even in its present advanced position.

Since the date of the Preliminary Notice prefixed to the last volume, the Society has received the same liberal support which it has so long experienced, in numerous accessions to its members, and in the zealous co-operation afforded at its general shows and at its numerous district competitions. A reference to the printed lists, as published in the transactions, and otherwise extensively circulated, will shew the extent and varied character of the premiums which the Society has, in consequence, been enabled to offer. Some of the more important of these premiums may be shortly noticed.

For essays and reports, there are nineteen specific subjects on which competition is invited. Among these, for the investigation of points connected with the science of agriculture, liberal encouragement is held out for essays or memoirs on the influence of soil on vegetation; on the absorption of liquid solutions by timber, and their effects; on the radical excretions of plants; and for reports of experiments with various substances as yet not employed in agriculture, or various mixtures of such as are employed, for the purpose of determining their positive and relative value as fertilizers.

In the section of Essays and Reports, having reference to the practice of agriculture, fifteen subjects are this year announced, ten of which have recently been adopted. Of these, the leading are premiums of liberal amount, for experiments with certain specific manures, according to a defined classification.

The other subjects in this class are for experiments with sheep salves, to ascertain the comparative merits of some of those recently introduced; for improvements in the mode of washing sheep; on the comparative merits of reaping grain by the scythe and by sickles; on the most economical mode of maintaining farm horses; for experiments in mixing soils; on the most efficient and economical mode of collecting and applying liquid manure; on obtaining new and superior varieties of the different cultivated agricultural plants; on the influence of plants taken as food on the taste, flavour, and quality of dairy produce; for an account of the management of water meadows, founded on recent experiment; for experiments in deep ploughing; for reports pointing out the agricultural crops, or kinds of forest trees, which thrive best on the geological formations of Scotland; and for reports on the hardy agricultural and other useful plants

of China, and those of the Himalaya and other alpine parts of India; and for approved accounts, founded on personal observation, of useful practices in rural or domestic economy, adopted in other countries, which may be advantageously introduced into Great Britain.

For a number of years, the Society has offered liberal premiums for geological surveys and reports, and for reports on the coal formations of Scotland; and numerous valuable papers have been received, several of which have, from time to time, been published in the Transactions. This year it has been deemed proper to suspend this class of premiums, there being in hand a considerable accumulation of unpublished surveys and reports.

The class of agricultural machinery contains several new subjects of interest. The premiums for the improvement of waste lands, which frequently bring forward reports of value, are continued. To give still greater encouragement for the cultivation of waste lands, the Directors have just ordered a die to be prepared for appropriate medals as premiums in this class. Dies for special medals for ploughing competitions, cottages, and other premiums, have also been contracted for. These, and the dies which the Society already possesses for first-class premiums, will enable the issue of medals, both as regards extent and variety, in a manner hitherto unequalled.

A series of premiums have been adopted in the class of crops of culture which have already attracted considerable notice, and promise to be attended with very beneficial results. The Society long felt the importance of encouraging the raising of seeds, both of corn and turnips, of a superior quality. It observed, with interest, the attention given to this object by local societies, and it was thought that considerable advantage would result by aiding the premiums of these associations. Accordingly, the society placed at the disposal of local agricultural societies, for four successive years, in each of six districts, its honorary medal, to be given, in addition to the money-premiums of the local societies, to the grower of the best of fifteen named descriptions of seeds, for corn and other crops, raised in the district, being an offer of ninety medals annually. Competitions under this offer have taken place at Fettercairn, Annandale, and East Lothian, and further applications from societies in other districts have been received. In connection with the general show at Edinburgh, premiums were offered for varieties of white and red wheat, which should, on trial, be found best adapted for the climate of, and general cultivation in, Scotland. The wheat selected at this competition was distributed in various districts, and, in due time, reports are to be transmitted of the results of the trials made with this selected seed.

Besides the seed premiums noticed, there is a special premium of the gold medal for raising improved Swedish turnip seed, and a similar premium for the seed of the yellow turnip, both to be selected from the best and purest approved stocks of mature selected and transplanted bulbs, or from the seeds of turnips which shall have been so selected and transplanted.

The Society continues to place at the disposal of its resident members and of local agricultural societies, its silver plough medal, to be awarded at ploughing competitions held under defined regulations, on condition that money-premiums are given in the district. The advantages of this system have been very great—no class of premiums on the list being more widely or more keenly contested, at competitions exhibiting sometimes upwards of a hundred ploughs. The number of these medals now issued within the year averages fully sixty, and as only one is allowed for each competition, an idea may be formed of the wide range over which they are distributed.

The Society continues its encouragement on a liberal scale, for the improvement of the breeds of live stock at district competitions. This department has always received a large share of the funds at the Society's disposal, and the beneficial effects are apparent in every district. The competitions are in charge of the Society's members connected with the districts by property or residence. At present, competitions for cattle, horses, sheep, and swine, are given in no fewer than thirty-five districts, each having the benefit of the premiums for a series of years.

In the Preliminary Notice to the last volume, it was stated that premiums, in a systematic form, had been commenced for the improvement of the quality of wool, to be awarded at a general competition at Edinburgh, conducted by eminent staplers and judges of wool. During the last two years, there were successively competitions for Leicester and Cheviot wool, and this year the competition is to be for wool of the Black-faced breed. Premiums are also offered annually for the several descriptions of fleeces at district competitions; and premiums are given for improvement in sheep shearing, in those districts in which the sheep premiums are in operation.

The premiums for the best kept cottages and cottage gardens continue to be productive of great improvements in the habits and comfort of the peasantry in almost every district of Scotland. They are at present given in thirty-three parishes, and the applications from other parts of the country are usually greater than can be acceded to. But the claims are regularly minuted, that they may be admitted according to priority. In the hope of gradually introducing a better system in the construction of cottages, the honorary premiums of the gold and

silver medals are continued to proprietors, for erecting cottages on their estates upon an improved style, and with greater attention to the comfort of their occupants. In connection with this section of the list, premiums are offered in various districts for promoting dexterity in the use of the spade, and for improving the cultivation of small possessions by the introduction of green crops.

The class of woods and plantations offers ten premiums. Among its new subjects will be found liberal premiums for the formation of Arboretums; for reports on the state of the larch forests of Switzerland and the Tyrol; and for reports on the diseases which prevail in the larch plantations of Scotland.

The general shows have, for many years, formed a very prominent feature in the proceedings of the Society. Their success may be said to have been without an exception, while every succeeding year has increased their extent and public interest. The meeting at Berwick, from the importance of the districts immediately interested, and the superior quality of their stock, had been looked to with more than usual interest, and it fully realized the expectations entertained. The aggregate of the stock shown was 962. But, up to the date of this notice, the general show at Edinburgh in August last, was unquestionably the most auspicious of these great meetings. The numbers of the stock were the largest which had on any previous similar occasion been brought together; the quality was excellent, and in several of the classes it was so in a high degree. The implements were the most numerous and valuable which had been exhibited at any of the Society's shows. The concourse of visitors of every rank, from all quarters of the country, was great—many thousands beyond the attendance at any previous show—and the arrangements, in every department, were conducted in the most efficient and admirable manner.

This year, the general show takes place at Dundee, on the 8th, 9th, and 10th of August. By the liberality of the gentlemen of the districts immediately interested, a numerous list of premiums has been offered. From the encouragement given, and the arrangements made, an extensive and interesting exhibition is confidently looked for. In 1844, the show is fixed to be again held in Glasgow. The public spirit and liberality of the western metropolis afford a guarantee that, as regards amount and variety of premiums, this meeting will surpass every show that has preceded it.

The general shows have now been held in the principal districts of Scotland, and attention has thus been fully drawn to the objects proposed to be accomplished by them. It has, in consequence, been suggested, whether these general exhibitions, instead

of being held annually, may not expediently be fixed at an interval of probably three years. This suggestion will, in due time, receive the deliberate consideration of the Directors and of the Society.

A general description of the plan and arrangement of the Society's new Museum was given in the Preliminary Notice to the last volume. The establishment was opened soon after the date of that notice. In point of extent, variety of objects, and arrangement, the Museum is not equalled by any similar undertaking. The collection continues steadily to increase; and the donations, in every department, are numerous and valuable, and are received from every district of the country. A catalogue has been published, extending to about 150 printed pages, which, from the careful and accurate manner in which it has been prepared, will prove a convenient guide, as well as a most useful and instructive manual of reference, to the numerous objects constituting the very interesting collection which the Museum comprehends.

The Museum is in charge of a Committee of the Society's members—the Earl of Cathcart, Convener, as successor to the Marquis of Tweeddale, on his Lordship leaving the country for India. The anxious attention bestowed by the members of the committee individually, in the formation of the establishment, and in its subsequent management, calls for the warmest acknowledgments.

The Society's great object in this establishment has been, that it might prove as widely useful as possible. Accordingly, from the first, the public has had free access; and it is gratifying to state that, although thus thrown open to all classes, the privilege has not, in a single instance, been abused. Visitors inscribe their names as they enter, in a book kept for the purpose, and this record shews that, within the comparatively short period since the Museum was opened, the visitors have amounted to the large number of nearly 16,000—a fact which strikingly illustrates the interest taken by the public in the institution, and the advantages which may be expected to be derived from it.

The Society has all along been impressed with the importance of placing the establishment on a permanent basis, and this, if possible, without encroaching on the funds of the Society. The appeal made with this view to the members of the Society individually was responded to in a most liberal and gratifying manner; but the sum which was raised, though large in amount, fell far short for so great an undertaking. In the hope, however, that additional funds will eventually be available, the Directors have just concluded an arrangement, by which they have been enabled to acquire, on favourable terms, for the Society as proprietors, the present elegant and spacious premises, which, though de-

signed and specially fitted up for the Museum, the Society has hitherto held merely as lessees. By this arrangement, besides the important advantage of providing for the permanency of the establishment, the Society secures against possible risk, the large sums it necessarily expended in the progress of the building, in erections and fittings of a fixed nature.

Within the period to which this notice more immediately relates, an important addition has been made to the ordinary proceedings of the Society, which, from the success that has already attended the experiment, promises to realize very satisfactory results. We allude to the Monthly Meetings held in the museum during the winter and spring months. It had appeared to many that some means ought to be adopted for giving effect to a wish which had been expressed, that members resident in and near Edinburgh, and who are not directors, should be afforded an opportunity of becoming acquainted, to a greater extent than attendance at the half-yearly meetings enabled them to be, with some of the details of the Society's business, and of taking a share in the proceedings of the Society, by hearing read and discussed selected papers on interesting and popular subjects, and of examining the specimens, books, and models, immediately on being presented to the Society; and also of making and hearing suggestions of a useful and practical nature. To afford such opportunities, these monthly meetings were resolved on; and the experience of two sessions has fully proved their utility. They have brought forward numerous special communications and donations; and, it is not doubted, these will continue to increase. The proceedings of each meeting, with a summary of the papers read, are immediately published in the newspapers of the day; so that the advantages are not confined to members in Edinburgh, but are shared by the country at large.

The proceedings of the Society in another object of great importance to the farmers in Scotland—we mean the obtaining for them the services of a chemist, to analyze soils and manures—may be here noticed. It is well known that, for some years past, the Directors have taken every opportunity of directing attention to the valuable aid which may be given to the operations of the farmer, by a knowledge of those recondite principles influencing the growth of plants. By the liberal premiums which they offered on various points in the science of agriculture, experiments were zealously undertaken, and reports drawn up, of such a nature, and in such numbers, as to shew that practical agriculturists in Scotland had become alive to the benefits derivable from the discoveries of chemistry and vegetable physiology. The Directors perceiving, from these and other circumstances,

that the time had come when the appointment of an agricultural chemist would be hailed with cordial satisfaction by the farming interest in Scotland, remitted the subject to the consideration of a committee. But this committee found that it would be quite impossible to procure the appointment of any chemist of celebrity as an officer of the Society, except on terms which would withdraw a large portion of its income from its own proper and paramount objects. They therefore inquired as to the likelihood of aid from Government. But their application was unsuccessful; and, therefore, when the Society held its General Meeting, on 5th July, 1842, the committee were unable to point out any plan for accomplishing the desired object, unless, as suggested by one of their number, agriculturists and agricultural societies combined, by annual subscriptions, to raise a sufficient fund to command the services of one or more eminent chemists, who might be occupied during a part of the year in analyzing soils and manures, and during the rest of it in visiting different districts, to diffuse information and afford advice.

This suggestion having been favourably received, the general meeting again remitted to the Directors, to take such steps as they might judge expedient for bringing about the appointment of a chemist. It was, therefore, with no small satisfaction that they were shortly afterwards made acquainted with a proposal, by some of the farmers in the neighbourhood of Edinburgh, to follow out the plan suggested at the general meeting of the Society, and to raise, by individual subscriptions, such an annual sum as might be sufficient to command the services of one or more chemists. A prospectus was drawn up, stating, generally, the duties which were expected from the chemist, and the privileges which should belong to subscribers, which having been submitted to the consideration of the Directors of the Society, they immediately passed a resolution giving to it their cordial approbation.

A committee having been named, they forthwith entered into communication with the Directors of the society; and the result was an arrangement by which this chemical association was linked in intimate and cordial alliance with the Society. It was agreed, on the one hand, that £50 annually should be paid by the Society to the funds of the association, so long as £350 was raised annually by subscribers; and that the Society should afford for the meetings of the association the use of their rooms in the museum, with fires and lights when necessary; and, on the other hand, that three out of the nine subscribers, who were to compose the committee of management of the association, should be appointed by the Society—that such of the specimens of soils and manures

analyzed as were fit for the Museum should be deposited there—and that the reports of the chemist should be published, exclusively, in the Society's Transactions.

This arrangement was approved of at the anniversary meeting of the Society and at a general meeting of the subscribers to the association, both held in January last; and, at the same time, a committee of management was named, in whom was vested the appointment of the chemist. The committee wisely delayed the appointment till the funds placed at their command amounted to such a sum as would induce chemists of high character to come forward as candidates. Nor were they very long in suspense; and, accordingly, having advertised for candidates, they will, before these pages have reached our readers, have executed the important duty of electing the individual who is to be the chemist of the association.

It is gratifying to mention that, although the association has been only a few months in existence, it already comprises 450 members, of whom 140 are tenants, and above 300 are landed proprietors. Its income is said to be about £630, of which about £70 is contributed by the former class, their subscriptions having been limited to 10s. yearly.

The Veterinary School, under the patronage of the Society, continues its successful career. It is numerously attended by students from almost every district of Scotland, and from England, Ireland, and the Colonies. At the two examinations which have taken place since the date of the last notice, upwards of fifty graduates received diplomas. The examinations on the structure and diseases of the horse and the other domesticated animals, take place annually in presence of the Society's committee in charge of the college, and of the Directors and members of the Society. They are conducted in the most anxious and careful manner by a number of the most distinguished members of the medical faculty in Edinburgh, assisted by veterinary surgeons of eminence. The country has thus an ample guarantee that the diplomas are only conferred after the knowledge and merits of the candidate have been fully and carefully ascertained.

The notice which has now been given of some of the Society's recent proceedings is, from the limited space allowed for the purpose, necessarily of a very general and imperfect character; but this is of the less importance, seeing that its Transactions and the reports of the Society's meetings, published as these take place, afford, in a more ample form, information as to the business done, and as to the objects of public interest to which the attention of the Society has been directed.

It has, on such occasions as the present, been usual to refer to the proceedings of the Society in connection with any event

possessing peculiar interest to the country; and, in the present instance, we have the gratification of recording its proceedings on the auspicious occasion of Her Majesty and Prince Albert's visit to Scotland in August last. On the intelligence being received that the Royal visit was to take place, the Society, as it had done on the occasion of the visit of His Majesty George IV., took a lead, in calling an extraordinary general meeting of the Society, to vote Addresses of congratulation. At this meeting, the Address to her Majesty was moved by the Duke of Buccleuch, and seconded by the Earl of Rosebery; and the Address to Prince Albert was moved by the Duke of Argyle, and seconded by Lord Dunfermline. Both Addresses were voted in a manner befitting a society which has ever been distinguished for its loyalty and its attachment to the Throne. They were presented by the Duke of Hamilton and Brandon and the Duke of Argyle, attended by a deputation consisting of noblemen who had held the offices of President and Vice-President, with three of the Ordinary and one of the Extraordinary Directors, accompanied by the Treasurer and Secretaries of the Society.

The Addresses were as follow:—

To the QUEEN.

MOST GRACIOUS MAJESTY,

We, your Majesty's loyal subjects, the Highland and Agricultural Society of Scotland, assembled in an extraordinary general meeting, on the auspicious event of your Majesty's arrival in this your ancient kingdom, most gratefully avail ourselves of the occasion of your Royal presence, humbly to approach your Majesty with the united expression of our devoted fealty to the Crown, of our profound regard towards your sacred person, and of our deep sense of the distinguished mark of your Royal favour, which your Majesty, by this gracious visit, confers upon your faithful people of Scotland. Associated for the advancement of agriculture and the useful arts therewith connected, and incorporated for these purposes by an early charter of your Majesty's royal ancestor, George the Third, our anxious endeavours have been directed to improve, by all the means at our command, the productive industry of the country, and with this the moral and social condition of the people; and we hail the happy arrival of your Majesty amongst us, as animating us in our efforts, by manifesting to every class the deep and generous interest which your Majesty takes in the happiness and wellbeing of this part of the empire.

Cherishing with national feelings the memory of a long line of illustrious princes, whose royal dignities are centered in the person of your Majesty, as the august representative of the Royal House of Scotland, we gratefully contrast with the former condition of this once divided nation, that which it now presents, indissolubly united with the other parts of the empire; and enjoying, under the safeguard of a constitutional throne, the benignant sway of your Majesty, and unequalled opportunities of advancing in the cultivation of the arts which pertain to civilisation and peace.

We earnestly and confidently trust that your Majesty, during your short sojourn in Scotland, will derive gratification corresponding with your kindly feelings towards the country, from witnessing its general prosperity, the peaceful condition and advancing industry of the peasantry; with the effects of that system of moral and religious education so long established amongst us.

On the occasion of the auspicious visit of your Majesty's royal predecessor, George

the Fourth, to Scotland, this Society had the gratification to receive a signal mark of Royal favour, and to be then assured that the course it had pursued was such as to meet with the approbation of his Majesty; and we now humbly entertain an ardent hope that your Majesty will find reason to be satisfied that our more recent proceedings have been such as to warrant a continuance of Royal countenance and favour.

Sealed with the corporate seal, and signed at desire and in presence of a special general meeting of the Society, by his Grace James Henry Robert Duke of Roxburghe, K.T., senior vice-president, in the chair, in the absence of his Grace Charles Duke of Richmond, K.G., President of the Society.

(Signed) ROXBURGHE, *V.P.*

Society's Hall, Edinburgh, 29th August, 1842.

To His Royal Highness PRINCE ALBERT of Saxe-Coburg and Gotha, Knight of the Most Noble Order of the Garter, &c. &c. &c.

MAY IT PLEASE YOUR ROYAL HIGHNESS,

We, the Highland and Agricultural Society of Scotland, on the occasion of the auspicious visit of your Royal Consort, our most gracious Sovereign, and your Royal Highness, to this part of the British dominions, most respectfully offer to your Royal Highness our warm congratulations on your arrival amongst a people who bear that affectionate regard to your Royal person, which your public and private virtues are so eminently calculated to command.

Having already the high honour of numbering your Royal Highness amongst the members of our body, we trust that your progress through Scotland will shew that the arts which it is our duty to promote are advancing, and that the people of Scotland continue to manifest, by their habits of industry and order, the effects of that moral and religious education, which it has heretofore been their pride and happiness to enjoy.

We earnestly trust that the favourable impressions which your Royal Highness may have formed of our country, may be confirmed by your visit to it; and the connection of your Royal Highness with this part of the empire may long continue; and that many future occasions may be presented to us of manifesting to your Royal Highness our feelings of attachment and regard.

Sealed with the corporate seal, and signed at desire and in presence of a special general meeting of the Society, by his Grace James Henry Robert Duke of Roxburghe, K.T., senior vice-president, in the chair, in the absence of his Grace Charles Duke of Richmond, K.G., President of the Society.

(Signed) ROXBURGHE, *V.P.*

Society's Hall, Edinburgh, 29th August, 1842.

I.—EXPERIMENTS AND OBSERVATIONS ON THE PRODUCTION OF BUTTER.

By Professor Traill.

The produce of the dairy forms so important a branch of agricultural industry, that it appears surprising how few attempts have been made to investigate the comparative merits of different methods, employed in various places, for the production of butter and cheese. The qualities of these articles are well known to differ greatly in our own country; yet each district has gone on for long periods to follow its own methods, as if each had attained perfection in the art. This is a proof either of the want of any fixed principles to guide us in the practice of these important economical operations, or of their being unknown to the majority of farmers.

The subject long engaged the attention of the late estimable Dr Gerard of Liverpool and myself, and for several years, especially in the years 1806 and 1807, we carried on many experiments; in some of which we were assisted by our friend, Dr Bostock, now of London.

It was originally intended to comprise in our investigations the whole subject of the production of butter and cheese; but our professional avocations, and other interruptions, prevented the completion of our plans, after we had performed numerous experiments on the production of butter. The hope of being one day able to complete them, has hitherto prevented any account of them being published. On the death of Dr Gerard, the whole papers, in a state of great confusion, came into my possession; and I now propose to lay before the Highland and Agricultural Society of Scotland the principal results which we obtoined.

We had a dairy of four, sometimes of five, cows at our disposal; but, after numerous preliminary trials, we found that the numerical results, on the quantity of the butter obtained, were most uniform and satisfactory when we made each experiment on a few pints of milk only. It is true that the proportional yield of butter was sometimes greater from a large than from a small quantity of cream or milk; but the different experiments were found to be most accordant on being repeated, when we operated on quantities not exceeding six English pints for each churning. This probably arose from our being then able to carry on the process in glass vessels, which permitted us to see the progress of the operation, and to collect the product more perfectly; and also from our being enabled to use, in experiments on this small scale, a more delicate balance to ascertain the weight of the butter obtained.

We were also thus enabled to make the comparative experiments on the same milk, on the same day—points of essential importance—as the richness of even the same cow's milk is liable to vary considerably from day to day, as we found from experiment, according to her food, her health, and possibly, too, according to the state of the weather. We also found that the time which had elapsed from the last calving had much influence on the quantity of the butter. The quantity of butter was smallest, and the proportion of cheesy matter greatest, just after calving; and, generally speaking, the milk of those cows which yielded the *least* quantity of milk was richest in butyraceous matter. Thus the quantity of butter afforded by a quart of milk of a small Alderney cow was considerably more than from a quart of the milk of the large Lancashire breed.

We proposed to ourselves various objects; such as ascertaining accurately the temperature acquired by milk in churning, (which, I may state in general terms, without detailing the experiments, we found to range from 5° to 8° of Fahrenheit;) the effect of external temperature on the production of butter; the effect of adding water to the churn, as is practised in many places; but, above all, to ascertain the comparative advantages of churning—

1. Sweet cream alone.
2. Sweet milk and cream together.
3. Sour cream, or that slightly acid.
4. Sour milk and cream together.
5. Scalded cream, or what is called *clouted cream*, as practised in Devonshire.

Each of these five methods of preparing the milk afforded very different results; and, as these investigations seem to be the most important, I shall give them more fully than the rest, selecting, from numerous experiments, those which were most carefully performed, and are, therefore, most worthy of confidence. Although the absolute quantity of butter differed with the season and condition of the cattle, yet as the five methods were practised at the same time, on equal quantities of the mingled milk of four or five cows, the comparative results of each series may be considered as not far from the truth.

It is well known that the milk first drawn from the cow is far inferior in quality to that last drawn; the latter is technically, in Lancashire, called the *afterings*, and in many towns is generally sold as cream. It seemed also an object of interest to ascertain the comparative quantity of butyraceous matter yielded by the first and last part of the milking, as also the quantity of *caseine* or curd in each.

Series 1.

The comparative Value of the First and Last Portions of the Milk.

For this purpose a cow was selected which had calved five weeks before, and the experiments were begun on Monday, 26th May, 1806.

No. 1 was the first pint milked.

No. 2 was a pint of the whole milking, after the separation of No. 1 and No. 3.

No. 3 was the last pint of the milking, or *afterings*.

As in previous experiments, *scalding* the milk was found to favour the more perfect separation of the butter, after the three portions were allowed to remain twenty-four hours in the milk-house. They were at the same time placed in earthenware basins, in a pan of water heated to 180° Fahr. They were removed within an hour from the water, when the milk had acquired a temperature of 130°. They were replaced for ten hours in the milk-house, and then examined. No. 1 then shewed scarcely any indication of cream. It formed a very thin pellicle only; and the quantity, being too small to be churned, was estimated, from other comparative trials, to be no more than equivalent to five grains of butter. No. 2 was evidently richer to the eye, but the cream was pale-coloured, and, when churned, yielded 181 grains of firm butter. No. 3, The cream, before churning, had a rich yellow tint; the butter produced was well flavoured, and weighed 551 grains. The difference between the richness of the first milk and the afterings, in a cow yielding about fifteen pints of milk at each milking, is thus as 1 : 110.

When a cow has calved less recently, the difference between the first milk and afterings, however, appears not so great. On the 9th of August, the milk of the same cow, which then yielded fourteen and a-half pints at a milking, was subjected to experiment in a similar manner.

The three portions were placed in similar basins in the milk-house for forty hours, and were then scalded till the temperature of the milk rose to 145°. The milk was drawn off next day from below the cream by means of a siphon, and the three portions were churned, in glass vessels, at the same time, for thirty minutes. The butter was soft and very white, although it was allowed to remain for twenty-four hours after churning in cold water. This probably arose from the heat of the weather; the thermometer in the shade then standing as high as 73°. When the butter was washed, and worked to free it from water,

No. 1	yielded	31 grains.
No. 2	...	252 ...
No. 3	...	416 ...

Here the proportion between the first and last milking is as 1:13.42 nearly, or 1:13½.

On this occasion, we took the opportunity of repeating an experiment formerly made on the proportion of caseine or curd in each of those portions of milk, by coagulating small but equal parts of each by means of rennet, and also by sulphuric acid, which we had found to afford a larger and more firm curd than rennet. Two ounces of each portion of the milk, after the cream was removed, were measured out, (that is, one-eighth of an English pint;) a teaspoonful of filtered rennet was added to each; to equal quantities of the same milk forty drops of sulphuric acid were added; and the six cups were placed in boiling water for some minutes. They were all firmly coagulated. The curd was separated from each; and, when equally dried, in a heat about that of boiling water, each was accurately weighed.

	With Rennet.		With Sulphuric Acid.
No. 1	gave of dry curd 14 grains.	...	18 grains.
No. 2	... ... 13 ...	...	18 ...
No. 3	... ... 14 ...	...	19 ...

This shews that, though the quantity of oily matter differs materially in the first milk and the afterings, the proportion of caseine or curd differs but little.

The experiments shew the caseine obtained from each pint to be equal to—

	With Rennet.		With Sulphuric Acid.
No. 1	... 112 grains of curd.	...	144 grains.
No. 2	... 104	...	144 ...
No. 3	... 112	...	171 ...

Series 2.

Comparative Quantity of Butter yielded by

No. 1. Sweet cream churned alone.
No. 2. Sweet milk and its cream churned together.
No. 3. Sour cream churned alone.
No. 4. Sour milk and its cream churned together.
No. 5. Scalded cream, or Devonshire cream, churned alone.

On the 24th May, 1807, the milk of four cows was drawn in the same vessel, passed through a strainer, and then divided into five portions of six English pints each, which were placed in similar basins of earthenware, in a milkhouse, the temperature of which ranged from 55° to 60° Fahr.

Monday, 25*th*.—The temperature of the air was very hot, 76° ; but that of the milkhouse, by constant evaporation of water, was kept about 60°.

Tuesday, 26*th*.—Thirty-nine hours after the milk had been drawn from the cows, it was removed from below the cream of No. 1 and No. 3, by a siphon; and we immediately began to churn the cream of No. 1, and the milk and cream of No. 2, in glass vessels.

No. 1. *Sweet Cream churned alone.*—Having previously found that the addition of a small quantity of cold water to thick cream facilitated the separation of the butter, half-a-pint of water was added to the cream, and it was found that the temperature of the mixture, at the commencement of the churning, was 62°. In fifteen minutes, butter appeared in grains; the churning was continued for twelve minutes longer, *i. e.* twenty-seven minutes in all, when the temperature of the whole had risen to 70°. The butter was now collected into one mass; but, from the warmth of the weather, was very soft. It was, therefore, put into cold water, and placed in the milkhouse until the morrow, when it was worked and washed in the usual way, and weighed 1386 grains. It was of a good colour, and perfectly well flavoured.

No. 2. *Sweet Milk and its Cream Churned together.*—The mixture of sweet milk and cream was churned at the same time; but, though cold water was here added, after one-and-a-half hour's churning, no butter was to be seen. The churning was continued for as long, (in all, for three hours,) but without our obtaining a particle of butter.

No. 3. *Sour Cream churned alone.*—On *Thursday*, 28*th May*, the cream of No. 3, which had been separated on Tuesday, and placed in the milkhouse, was now slightly acid, and was churned, after half-a-pint of cold water had been added to it. In twelve minutes butter appeared; and in eight minutes more, it had united into one mass. During the churning, the temperature of the cream had risen from 54° to 63°. The buttermilk was very poor, fit only for pigs. The butter, when well washed, and worked to separate the watery part, weighed 1756.5 grains. The colour and taste were very good.*

No. 4. *Sour Milk and its Cream churned together.*—On the same day, 28*th May*, the milk and cream which had become acid were churned together, and half-a-pint of cold water was added. It was fully fifty-seven minutes before any butter appeared; and before the churning seemed to be completed, one hour and fifty minutes had elapsed. This shews that much more time is required to churn milk and cream together than to obtain the butter from

* The buttermilk from cream alone was poor and thin, in this and in all our experiments, whether water had been added to the churn or not.

cream alone. The butter was, in this instance, diffused in small grains, and, when washed and worked as long as any colour was communicated to the water, it weighed 1968 grains. Its colour was rather paler than the last, but its flavour was good.*

No. 5. *Clouted Cream churned alone.*—On *Tuesday, the 26th*, the milk and cream of No. 5 were placed in a vessel of warm water, until the temperature of the milk rose to 156°. In these experiments on scalded cream we had the assistance of a Devonshire dairymaid, to superintend this part of the process. She generally placed the vessel containing the milk among the embers of a low fire; but we preferred water as the heating medium. She judged of the due degree of heat merely by dipping her finger in the milk, and the wrinkling of its surface; and we found that the heat considered by her sufficient generally ranged from 135° to 156°, and was occasionally as high as 160° or 162° Fahr. The milk was drawn from below the cream by a siphon; and the latter was placed in the milkhouse, until the following day, before it was churned. It was churned on Wednesday, the 27th. The milk of this portion was very poor, had a scalded taste, and would have been unsaleable.

I may here state that, by churning the milk of No. 1 and of No. 3, we could obtain a few more grains of butter, on some occasions; but we never could obtain the smallest quantity of butter from the milk of No. 5—so completely does the scalding process separate the butyraceous matter from the milk. The butter of No. 5, when well worked and washed, weighed 1998 grains. It had a rich yellow colour, tasted agreeably, and was quite free from the peculiar scalded flavour of the milk.

Series 3.

This series, a repetition of the preceding experiments, on the milk of four other cows, was commenced on *Thursday, the 25th of June*, 1807, or a month after the last series. As before, the whole milk was mixed, strained, and divided into five equal portions, of six pints each, which were treated as the last.

No. 1. *Sweet Cream churned alone.*—*On the 26th*, or in twenty-four hours after the milking, the milk of No. 1 was drawn off by the siphon. The temperature of this portion, at the commencement, was 62°; and when the churning was finished, had only attained to 65°. The churning required forty-five minutes. Water had been added as before, and the butter was obtained in

* The buttermilk from No. 4—that is, from churning milk and cream together, when slightly acid, is a bland, agreeable fluid, containing much albumen or caseine. It finds a ready market in towns, and is much used in Lancashire as an article of diet. It is therefore a valuable product, which ought to be considered in an economical point of view.

grains like peas. When well worked and washed, it weighed 1137 grains. Its colour was good and its flavour excellent.

No. 2. *Sweet Milk and its Cream churned together.*—The sweet milk and cream churned together afforded no butter.

No. 3. *Sour Cream churned alone.—On the 29th of June,* the cream, which had become sour, was separated by the siphon and churned. The temperature at the commencement, was 58°—at the end, it was 65°. The butter was fully formed in forty minutes, and united into one mass. Well worked and washed, it weighed 1247 grains. Its taste was good as was its colour.

No. 4. *Sour Milk and its Cream churned together.*—At the same time, the sour milk and cream were churned, with the same precautions as before. The churning occupied two hours; when the temperature had risen from 58° to 68°, or nearly 69°. When worked and washed, the butter weighed 1447 grains. The qualities equalled that of No. 3.

No. 5. *Clouted Cream churned alone.*—The cream of this portion was scalded on *Friday, the* 26*th June,* by being heated to 168°, which temperature it attained in one hour, the usual time required for this operation. On *Saturday, the* 27*th,* it was churned in forty-five minutes; during which process the temperature of the cream rose from 58° to 64°. When well washed and worked, it weighed 1591 grains. The butter in the mouth had a granular feel, which we attributed to the heat rising, by accident, too high; by which an unusual portion of caseine appeared to be separated with the cream. The butter had, however, no peculiar flavour from the process; although the milk would have been unsaleable, from a strong taste of *scalding.*

The general result of these experiments, confirmed by many similar trials is, that the largest quantity of butter is produced from the scalded or Devonshire cream; the next in quantity from the method of churning the milk and cream together, when they have become slightly acid; the third in quantity is afforded by cream kept till it is slightly sour; the smallest quantity is obtained from the sweet cream. We were unable to obtain butter from churning sweet milk and cream together; and in several other series attempted it no more.

In one series of experiments we used as much as 11½ English pints of milk in each experiment; but we then had to churn in vessels of tinned iron; and we did not find the results so uniform as when operating on smaller quantities in glass vessels.

SERIES 4.

This series was intended to decide on the qualities of the butter obtained by the four processes above detailed, as to keeping

fresh. These experiments were made, as those of the next series, on the butter obtained in most of our experiments. No. 1 always remained, when exposed freely to the air, longer without any rancid taste than any of the other kinds of butter. No. 3 and No. 4 were nearly on an equality in this respect: if there was any difference it was in favour of No. 3. No. 5 became rancid more quickly than No. 3 or No. 4.

Series 5.

Equal quantities of butter obtained by the four processes were salted with equal quantities of salt, then spread thinly on glass plates, and exposed to the air in a dry room. They were inspected from time to time, and it was ascertained that the taint of rancidity always appeared in the following order, commencing with that which shewed it first:—

In No. 5, or butter from scalded cream.
... No. 4, ... a mixture of sour milk and its cream.
... No. 3, ... sour cream.
... No. 1, ... sweet cream.

The cause of this difference in their power of resisting decay was believed to depend on the varying proportions of caseine, or curdy matter, in each. To determine this point, another series of experiments was undertaken.

Series 6.

Two hundred grains of each kind of butter were kept liquefied, by a moderate heat, in glass capsules; the oily matter was taken up by bibulous paper, successively applied, as long as any oily stain was perceptible; the watery liquid which remained below the oily matter was evaporated, and the solid residue, after being well washed, squeezed between folds of blotting paper, and dried, was carefully weighed. Unfortunately I have been unable to recover the details of this series of experiments; but the following are the general results, which decidedly shew that the presence of the greater quantity of caseine in butter coincides with its greater tendency to become rancid. The four kinds of butter afforded caseine in the following order, commencing with that which yielded the most:—

No. 5, butter from scalded cream.
No. 4, ... from acid milk and its cream.
No. 3, ... from acid cream.
No. 1, ... from sweet cream.

Experiments had been made in *October*, 1806, which proved that *overchurning*—that is, continuing the process after the

full separation of the butter—was very injurious to the quality of the butter, although it increased its weight; and these, though made before the experiments detailed above, shall now be indicated, as

Series 7.

The cream of six English pints of milk was separated by a siphon, and churned in a glass vessel. The butter was formed in about half-an-hour; but the churning was continued for half-an-hour longer, when the butter had lost its fine, yellowish, waxy appearance, and had become pale and soft, while very little liquid remained in the churn. This butter was so soft that it could not be washed and worked until it had remained some hours in cold water. It was pale, still rather soft, and, when weighed, = 2566 grains. That this was beyond the due quantity of good butter, from such a quantity of cream, was apparent, when the comparative experiments on the same quantities of the same milk, but only churned till the butter was well formed, gave the following results:—

No. 1, The sweet cream, overchurned, yielded		= 2566	grains.
No. 3, The acid cream duly churned,	...	= 2187.5	...
No. 4, The acid milk and its cream, do.	...	= 2397.5	...
No. 5, The scalded cream, do.	...	= 2671.	...

The butter of No. 1 tasted insipid, never became firm, and soon turned rancid. It was found to yield a very unusual quantity of both caseine and of watery fluid, which could only be separated by melting the butter.

Similar experiments were repeatedly made, the results of which shewed that overchurning is very injurious to the quality of the butter; but it adds considerably to the weight of the article; and it appears to be frequently practised in Lancashire, especially in manufacturing *fresh* butter for *immediate sale*.

It is a common opinion in Lancashire that considerably more butter is obtained by adding *hot water* to the churn than by using cold water. We had invariably found that the addition of a small quantity of cold water, especially in summer, greatly facilitated the separation of the butter, and rendered it more easily washed. But a dairyman informed us that the same quantity of cream, which will yield 14 lbs. of butter with *cold water*, will afford 15 lbs., or even 15½ lbs., with an equal addition of hot water. This formed the subject of

Series 8.

On the 15*th of November*, 1807, we took, from the mixed milk of four cows, two portions of six English pints each, and set them aside in a milkhouse, the temperature of which ranged from 59°

to 52°. *On the 17th November*, the cream was removed from each by the siphon, and churned at the same time, in circumstances as nearly equal as possible, except in the addition of water. The temperature of the cream, at the commencement of the churning, was 55°.

No. 1. To this portion an ounce and a-half of water, at temperature 45°, was added. After churning for eighteen minutes, the butter began to appear; two ounces more of water, at 45°, were added, and the churning was carried on for five minutes more. The butter was then worked and washed.

No. 2. To this portion of cream one ounce and a-half of water, at 105°, was added; butter began to appear after churning for thirteen minutes, when two ounces more of water, at 105°, were added, and the churning was continued for five minutes more, or eighteen minutes in all. The temperature of the contents of the churn was 71°. This butter was very soft, and, therefore, cold water was added, in which it was worked and washed.

Unfortunately, the note of the weight of the butter in this series has been lost; but I find it stated that the butter of No. 2 was rather more bulky, and weighed a little more than that of No. 1; that it neither was so firm nor of so rich a colour as the butter of No. 1; and that, on pressing it next day, some watery fluid escaped from it. From this we inferred that the quality of the butter was deteriorated by the addition of hot water; and that the quantity obtained, by this practice, of marketable butter, is not so great as is commonly alleged in Lancashire, although the time of churning is thus somewhat abridged.

The principal results of the experiments above detailed, are—

1. That the addition of some cold water during churning facilitates the process, or the separation of the butter, especially when the cream is thick and the weather hot.

2. That cream alone is more easily churned than a mixture of cream and milk.

3. That butter produced from sweet cream has the finest flavour when fresh, and appears to keep longest without acquiring rancidity: but that the buttermilk, so obtained, is poor, and small in quantity.

4. That scalding of the cream, according to the Devonshire method, yields the largest quantity of butter; which, if intended for immediate use, is agreeable to the palate and readily saleable; but if intended to be salted, is most liable to acquire, by keeping, a rancid flavour. The process of scalding is troublesome; and the milk, after the removal of the cream, is poor, and often would be unsaleable from the taste it has acquired from the heating.

5. That churning the milk and cream together, after they have become slightly acid, seems to be the most economical process on the whole; because it yields a large quantity of excellent butter

and the buttermilk is of a good quality—a point of some importance when buttermilk is largely used as an article of diet, as it is in Lancashire.

6. That the keeping of butter in a sound state appears to depend on its being obtained as free from uncombined albumen, or caseine, and water, as it can be, by means of washing and *working* the butter when taken from the churn.

II.—REMARKS ON CHURNING BUTTER.

By Mr John Ballantine, Edinburgh.

The writer of this Essay has been an extensive dealer in Scotch butter for thirty years, and he is of opinion that, with the exception of sweet butter made in the neighbourhood of Edinburgh and Glasgow, there has been rather a deterioration than an improvement in the quality of Scotch butter during that period. There has been, however, a very decided improvement in the quality of the butter made of late years by the farmers in the places above mentioned, which is chiefly attributable to the method now adopted, of making the butter from the *entire milk*, by which the dairy farmer is enabled to carry on his operations in a regular and systematic manner, to churn the milk at exactly the proper period, to regulate the temperature, and, in short, to conduct the whole process on certain principles.

Experience has fully proved that butter is yielded in the largest quantity and of the best quality by the *entire milk*, that is, the milk from which the cream has not been separated. It is equally certain that the milk must likewise be kept till it has acquired a certain degree of acidity, in which state also it affords the best buttermilk—a point of very great importance in a district where it meets with a ready sale.

Being connected with a dairy farm of about thirty cows, situated twenty miles south of Edinburgh, the writer proceeds to give an account of the system successfully followed out at that farm.

In the summer season, the milk of the thirty cows is placed, at the morning milking, in two zinc coolers of sufficient capacity, and allowed to remain there to cool till the evening. It is then drawn off by cranes or siphon into vats sufficiently large, not only to contain this quantity, but also the evening's *meal* or milking, which is mixed with it; and these vats are then put by, to stand totally undisturbed, till the whole acquires a sufficient degree of acidity. The time required for this purpose varies a little, according to the heat of the weather and the temperature of the milkhouse. The point is ascertained by the formation of a strong thick *brat* or scum on the surface, which then becomes

uneven. The two succeeding milkings are treated in the same way, kept, of course, in separate vats, and, after standing for at least two entire days, the whole is put into the churns. By this method the dairy churns three days in the week. Some of the milk is thus a little longer kept than other portions, but this does not affect the quality of the whole. The milk of Sunday and Monday is churned on the Thursday morning; that of Tuesday, Wednesday, and Thursday morning, on the Saturday and Thursday evenings; and that of Friday and Saturday, on Monday morning.

The churn used at this dairy is the *plunge*, or *upright* churn, which is reckoned superior to either the barrel or box-shape. Two churns are employed, driven by a walking beam with two arms, attached to the water wheel of the thrashing machine, and they work at the rate of thirty-eight or forty strokes in the minute. Should there not be milk enough for both churns, one can be used, and, by shortening the stroke of the churn-*staff*, it can be adapted to any quantity of milk, from 20 Scotch pints to 100; thus affording ample facility of churning at any intermediate time, when necessary. The milk being then carried in the vats from the milkhouse to the churninghouse, and put into the churns, as much hot water is added to it as brings the whole to the temperature of 65°. The churns are then set agoing, at the rate of thirty-eight or forty strokes in the minute, and this rate is continued till the *butter comes*, which requires from three to three and a-half hours. The velocity of the wheel is then diminished by letting off part of the water, and the churns made to go very slowly, in order to gather the butter. When this is accomplished, the dairymaid gathers the butter from the churn with her hands, well washed and rinsed in cold spring-water, and carefully squeezes the milk out of it: it is then put into a vessel filled with fresh spring-water, well washed, and made up into half-pound rolls for the market.

In the winter season, when the cows are fed upon turnips, the system is changed—the coolers are dispensed with, and the morning's milk is carried from the byre and put into the churn, closely covered up. The same is done with the evening's milk, and, next morning, hot water is added to bring the whole to the temperature of 65°, and the churns set agoing. By this method, both the butter and the buttermilk are wholly free from any taste of turnips. The souring of the milk may be hastened by adding a little that is already sour. When butter is made from cream, the temperature required is only 55°, and the time occupied in churning does not exceed an hour and a-half. Each meal of milk is put into coolers, not more than four inches deep, and allowed to stand for twenty-four hours. The milk is then drawn off by a siphon, and the cream, which is left on the bottom, gathered and put into a proper vessel; each gathering of cream is kept separate until it acquires sufficient acidity, when the whole is put into

the churn and churned. In the winter season, hot water is added to bring the cream to 55° of temperature. Butter may be made from sweet cream, but it is neither good in quality nor large in quantity, and longer time is required in churning. It is an unprofitable method. On the whole, the writer is now fully persuaded, from an experience of thirty years, that the most profitable way of managing a dairy is that of churning from the entire milk in the way described. It possesses the great advantage of being adapted to any degree of temperature which usually occurs in this country, whereas it is often very difficult to operate with *cream*, which will not answer with a heat above 55°. One hundred gallons of entire milk will yield, in the summer months, five per cent. of butter more than the cream will produce, taken from the same quantity of milk. It is hardly necessary to add that the greatest care must be taken to keep all the vessels in the cleanest state. The method of salting the butter is of the greatest importance; very slight errors in this respect cannot fail to deteriorate the butter and greatly reduce its price in the market. As already observed, the butter made from *entire* milk, brought to a certain degree of acidity, is not only the best in a fresh state, but is best calculated for long keeping in a sound state when salted. The method of salting, as practised at this dairy, is as follows:—

The butter is drawn warm from the churn; and it is an invariable rule *never to wash it or dip it into water*, when intended to be salted. The dairymaid puts it into a clean tub, which is previously well rinsed with cold water, and there works it, with cool hands, till all the milk is thoroughly squeezed out. Half the allowed quantity of salt is then added, and well mixed up with the butter, and in this state it is allowed to stand till next morning, when it is again wrought up, any brine squeezed out, and the remainder of the salt added. It is then packed into kits, which, when full, should be well covered up, and placed in a cool dry store—a small quantity of salt is usually sprinkled on the surface. The proportion of salt used at this dairy is half-a-pound to fourteen pounds of butter, avoirdupois.* There are two great errors in the curing of butter in Scotland, which have caused its price to be lower than that of foreign cured butter, namely, using butter made from cream, which is often too long kept, and not salting it *immediately* from the churn. Much of the butter cured in Scotland is delivered in a fresh state by the

* Dr Traill observes that the proportion of salt which he recommends is half-a-pound to sixteen pounds of butter, being rather less than the proportion recommended in this paper. Perhaps the difference may be explained by the quality of the salt, which, in Liverpool, is dry and fine. Salt for curing either butter or fish, should be purified from all admixture of potass or magnesia, and be perfectly dry. For butter, a fine-grained salt is preferred; for fish, a hard coarse-grained salt is the best. Mr Ballantine states that he considers some part of the first salt is washed out in the shape of brine in working up for the second salting.

farmer, and salted afterwards by the curer. Until the farmers shall learn to cure their own butter, the price of Scotch butter in the market will never equal that of foreign. This remark applies chiefly to the northern counties, the salt butter of which is selling at 84s., while foreign butter is bringing 100s. per cwt. in the London market. The writer of this paper sold upwards of five tons of butter, churned and cured as has been described, in the course of last year, at the rate of one penny or two pence per pound higher than that of any foreign butter in the markets here. The Clydesdale and west country butter is almost all consumed in the manufacturing districts, very little of it finding its way even to Edinburgh; and the butter made in this and contiguous districts being consumed here, little or none finds its way to the London market, otherwise there is no doubt but that it would be found fully equal to any foreign butter sold there.

If the Scotch farmers who supply the London market wish to obtain the top price, they must churn their butter from the entire milk, and cure it fresh from the churn in their own dairies.

It must be admitted, however, that, in situations where there is not a sale for buttermilk, this mode of churning will scarcely be so profitable as that from the cream, when, though the butter may not command the highest price, compensation will be made to the farmer by the cheese which may be made from the skimmed milk.

If any method could be discovered of making *cheese* from buttermilk, it would be of immense importance to all dairy farmers. This is a subject highly deserving of the attention of the Highland and Agricultural Society.

The two following Tables may be taken as shewing the aggregate results of many experiments in churning milk and cream:—

No. 1.

FROM ENTIRE MILK.

Season.	Temperature of the Churn when Set.	Time in Churning.	Heat of the Churninghouse.	Heat of the Churn when Butter came.
June, 1842.	65 Degrees.	Hours. 3 Min. 30	60 Degrees.	68 Degrees.

No. 2.

FROM CREAM ONLY.

Season.	Temperature of the Churn when Set.	Time in Churning.	Heat of the Churninghouse.	Heat of the Churn when Butter came.
October, 1842.	55 Degrees.	Hour. 1 Min. 30	54 Degrees.	59 Degrees.

ABBREVIATED REPORT OF EXPERIMENTS MADE WITH VARIOUS SUBSTANCES AS MANURES, by Mr MACLEAN, at Braidwood, on the Estate of Penicuik.

[Premium, Twenty Sovereigns.]

THE farm of Braidwood, occupied by Mr Maclean, is situated quite close to the base of the Pentland Hills, and is, consequently, at a considerable elevation above the level of the sea. The farm extends to about 400 acres, a large portion of which is very steep, consisting of sheep pasture-land on the face of the hill, while a good deal of the arable land is upon a sharpish or gravelly subsoil, frequently interspersed with wet and mossy portions. The average rent of the whole farm Mr Maclean states to be about 17s. per acre.

Mr Maclean seems to have taken very great pains, and to have gone to considerable expense, in making the various experiments detailed by him; and he has accompanied his report with very minute tables, which are here given in the exact form in which Mr Maclean himself has furnished them to the society.

The first experiment detailed was made upon a crop of clover and rye grass sown in 1841, and intended for hay in 1842. Mr Maclean applied twenty-four varieties of substances as top-dressings, upon this clover field, allowing one-twentieth part of an acre imperial to each, besides two portions of similar extent on which nothing additional was applied. The following is a list of the substances used by Mr Maclean, viz.:—

No. 1. Nothing.
2. Sand and Soot.
3. Peat-Ashes and Soot.
4. Clay-Ashes and Soot.
5. Carbon.
6. Guano.
7. Subsoil and Soot.
8. Compost and Soot.
9. Soil and Soot.
10. Gypsum.
11. Saltpetre.
12. Nitrate of Soda.
13. Ashes and Rape-dust.
14. Ashes and Gypsum.
No. 15. Ashes and Guano.
16. Nothing.
17. Ammoniacal Liquor.
18. Sulphate of Magnesia.
19. Soot.
20. Muriate of Ammonia.
21. Salt.
22. Subsoil and Urine.
23. Urine.
24. Moss and Urine.
25. Carbon Animalized.
26. Night Soil and Diluted Urine.
27. Rape-dust.
28. Sulphate of Ammonia.

The tables are so complete in their details, that it is considered most conducive to the objects in view by the society to give the whole of them as contained in Mr Maclean's report, so that it is the less necessary to draw the attention of the public to any remarks by the compiler, leaving every one to draw their own conclusions from the facts authenticated by the reporter, as well

as by two of his nearest neighbours. These statements are also accompanied by tables shewing the weekly progress made by each of the crops on the twenty-eight different portions, from the period at which the manures were applied to that of the produce being cut. On the most cursory glance at the results of these experiments as detailed by Mr Maclean, it is impossible to avoid being struck at the vast superiority exhibited by the five portions top-dressed with the following substances:—The gain per imperial acre, after deducting the price of guano, at the rate of 440 ℔ per acre, expense, £3 : 18 : 7, is £4 : 7 : 7. That from saltpetre, at an expense of £2, is £5 : 8s. From nitrate of soda, expense, £1 : 17 : 4, is £5 : 15 : 10. From sulphate of magnesia, expense, £1 : 1s., £4 : 12 : 10. From common salt, 440 ℔ per acre, expense 12s., £5 : 8 : 4.

Mr Maclean states "that the severe drought of the season has been rather unfavourable for the full development of most of the fertilizing qualities of the great proportion of the applications experimented upon. The farm, however, is situated in a mountainous district of country, at an elevation of between 800 and 900 feet above the level of the sea, and, consequently, in a humid climate, where the copious dews, falling nightly upon the grass, would, in some degree, assist in rendering the manures into a more soluble condition than could have been expected to take place in a climate more genial and dry.

"From the great benefit the whole of the applications derived from the genial showers which fell from the 28th June to the 10th of July, it is evident that the fertilizing qualities of artificial manure are brought more completely into action in a moist season than in a dry, and all crops appear to improve in damp weather; but the seedling grasses and clover plants seem to receive a stimulus which no condition the land could be put into by the most liberal application of farm-yard manure could convey to them. Plants as well as animals are benefited by a change of food; they get satiated as it were, upon a continuance of the same kind, and none more so than the grass and clover plants, which circumstance often draws, from intelligent and experienced agriculturists, the common remark, 'that the land is tired of producing them.' The experimenter, therefore, trusts that the following tables will afford ample illustration of the benefits which grass crops may derive from surface applications of the various manures experimented upon; and as nothing tends more to keep up the fertility of the ground than a luxuriant herbage, the ultimate profit to be derived from the application of these manures must not be regarded as limited to the grass crop alone.

"It will be observed, from a careful perusal of the tables, that luxuriance in crop does not always imply a proportionate degree

of weight; for example, that portion dressed with salt was always inferior in its appearance, and yet the weight of the produce is ample.

"It is also somewhat curious that the weight of dried hay per acre from the portion dressed with soot is only 200 stones, while with a mixture of sand No. 2, it is 202 stones; with No. 3, peat-ashes and soot, it is 217 stones—No. 4, clay-ashes and soot, 220 stones—No. 7, subsoil and soot, 230 stones; and with No. 8, compost and soot, 202 stones. These various substances being mixed with the soot, may, perhaps, give a more full development to the ammonia, which principally constitutes the fertilizing qualities of soot. The subsoil of No. 7 was of a rather rich quality, having a marly texture; the whole of the substances were in mixture with the soot about forty-eight hours, and were in a dried state before being mixed. The great produce and weight of dried hay, and the ultimate profit per acre, from the application of guano, No. 6; saltpetre, No. 11; and nitrate of soda, No. 12, give the most striking evidence of their value as top-dressing manures for seedling grass crops."

Experiments with various Manures, Simple and Compound, as a Top-Dressing upon Grass for Hay, in 1842; the Dressings were applied 7th May, Grass cut 24th June, and Win Hay weighed 5th July, and Stacked.

No. of Portions.	Manures Applied.	Quantity upon One-Twentieth of Imperial Acre.	Expense per Imp. Acre.	Weight when cut of 1-20th. (St. lbs.)	Weight when Win of 1-20th Acre. (St. lbs.)	Weight upon One Imperial Acre. (St. lbs.)	Value per Acre at 7d. per Imper. Stone. (L. s. d.)	Increase from Application, per Acre. (St. lbs.)	Value of Increase after deduct. Cost of application (L. s. d.)	Value of Aftermath. (L. s. d.)	Total Value per Imperial Acre. (L. s. d.)	Gain by Application, per Imp. Acre. (L. s. d.)	Loss by Application, per Imp. Acre. (L. s. d.)
1	Nothing.	.. ..	..	25 7	6 4	125 10	3 13 4	0 0	0 0 0	0 7 0	4 0 4	0 0 0	0 0 0
2	Sand and Soot.	2 Bush. each.	11/8	44 4	10 2	202 12	5 18 4	77 4	1 13 4	0 15 0	6 6 4	2 1 4	0 0 0
3	Peat-Ashes and Soot.	2 Bush, do.	16/8	47 2	19 12	217 2	6 6 8	91 6	1 16 8	0 15 0	7 1 8	2 4 8	0 0 0
4	Clay-Ashes and Soot,	2 Bush. do.	16/8	49 7	11 0	220 0	6 8 4	94 4	1 18 4	0 15 0	7 3 4	2 6 4	0 0 0
5	Carbon.	14½ lbs.	32/	32 12	11 7	230 0	6 14 2	104 4	1 8 10	0 14 0	7 8 2	1 15 10	0 0 0
6	Guano.	22 lbs.	78/7	74 4	19 13	393 8	11 12 6	272 4	3 18 10	0 14 0	12 6 6	4 7 7	0 0 0
7	Subsoil and Soot.	2 Bush. each.	11/8	40 0	11 7	230 0	6 14 2	104 4	2 9 2	0 15 0	7 9 2	2 17 2	0 0 0
8	Compost and Soot.	2 Bush. do.	13/4	42 0	10 2	202 12	5 18 4	77 2	1 11 8	0 15 0	6 13 4	1 19 8	0 0 0
9	Soil and Soot.	2 Bush. do.	12/6	43 7	11 0	200 0	6 8 4	94 4	2 2 6	0 16 6	7 4 10	2 12 0	0 0 0
10	Gypsum.	16¾ lbs.	12/	37 0	10 0	200 0	5 16 8	74 4	1 11 4	0 18 0	6 14 8	2 2 4	0 0 0
11	Saltpetre.	8¼ lbs.	40/	50 0	17 12	357 2	10 8 4	231 6	4 15 0	1 0 0	11 8 4	5 8 0	0 0 0
12	Nitrate of Soda.	8¼ lbs.	37/6	52 0	18 2	362 12	10 11 8	237 2	5 0 10	1 2 0	11 13 8	5 15 10	0 0 0
13	Ashes and Rape-dust.	4 Bu. 22 lbs.	45/8	38 8	11 0	220 0	6 8 4	94 4	0 19 4	0 15 0	7 3 4	1 7 4	0 0 0
14	Ashes and Gypsum.	4 B. 11 lbs. Gy.	21/1	44 0	10 12	217 2	6 6 8	91 6	1 12 0	0 13 0	6 19 8	1 18 0	0 0 0
15	Ashes and Guano.	4 B. 11 lbs. Gu.	52/7	56 0	11 0	220 0	6 8 4	94 4	0 1 8	1 0 0	7 8 4	0 14 8	0 0 0
16	Nothing.	.. ..	..	25 7	6 4	125 10	3 13 4	0 0	0 0 0	0 7 0	4 0 4	0 0 0	0 0 0
17	Ammoniacal Liquor,	56 lbs.	37/4	43 0	9 0	180 0	5 5 0	54 4	0 0 0	0 14 0	5 12 0	0 1 4	0 0 0
18	Sulph. of Magnesia.	8¼ lbs.	21/	53 2	14 7	290 0	8 9 2	164 4	3 14 10	1 5 0	9 14 2	4 12 10	0 0 0
19	Soot.	4 Bushels.	30/	50 0	10 0	200 0	5 16 8	74 4	1 3 4	0 15 0	6 11 8	1 11 4	0 0 0
20	Muriate of Ammonia.	1¼ lbs. and 40 Gall. Water.	74/8	48 0	10 7	210 0	6 2 6	84 4	0 0 0	0 16 9	6 19 0	0 0 0	0 15 9
21	Salt.	22 lbs.	12/	50 0	16 0	320 0	9 6 8	194 4	5 1 4	0 14 0	10 0 8	5 8 4	0 0 0
22	Subsoil and Urine.	4 Bu. and 80 Gall. Water Urine.	36/	48 7	12 0	210 0	7 0 0	114 4	1 10 8	0 15 0	7 15 0	1 18 8	0 0 0
23	Urine.	25 Gall.	52/1	50 0	15 0	300 0	8 15 0	174 4	2 8 9	0 16 0	9 11 0	2 17 9	0 0 0
24	Moss and Urine.	4 Bush. and 80 Gall. Urine.	36/	36 0	10 0	200 0	5 16 8	74 4	2 6 6	0 12 6	6 9 2	2 12 0	0 0 0
25	Carbon Animalized.	44½ lbs.	25/	41 2	8 7	170 0	4 19 2	44 4	1 5 10	0 15 0	5 14 2	1 13 10	0 0 0
26	Night Soil and diluted Urine.	112 lbs.	20/	44 0	11 7	230 0	6 14 2	104 4	2 0 10	0 16 6	7 10 8	2 10 10	0 0 0
27	Rape-dust.	44½ lbs.	64/	45 0	14 0	280 0	8 3 4	154 4	1 6 0	0 15 6	8 18 10	1 14 6	0 0 0
28	Sulphate of Ammonia.	2¾ lbs.	40/	46 2	10 7	210 0	6 2 6	84 4	0 9 2	0 10 0	6 11 8	0 12 2	0 0 0

Table shewing the Weekly Progress of the Grass Crops treated with the Manures above mentioned, from the period of their Application to the time of Cutting.—Saturday, 21st May.

First Inspection.

No. 1. Nothing.
2. A visible difference in colour.
3. Nearly the same.
4. Visible improvement, particularly upon the clover plants.
5. No difference.
6. Much improved, rye grass especially.
7. Considerably improved.
8. The same.
9. The same.
10. No difference from the unsupplied portion.
11. Great improvement.
12. Much improved.
13. A little improvement.
14. A little improvement.
15. Looking beautifully, and much improved.
16. Nothing.
17. Most luxuriant, especially in clovers.
18. Very healthy and strong.
19. Little improvement.
20. No visible difference.
21. No difference.
22. Little improved, being applied with too little dilution.
23. No difference.
24. A small improvement.
25. No visible improvement.
26. A slight degree of improvement.
27. No difference.
28. No difference.

28th May.—Second Inspection.

No. 1. Nothing—suffering severely from the continued drought.
2. Continues advancing steadily.
3. Much alike, improving steadily.
4. Excellent clover, most luxuriant.
5. No difference from the unsupplied portion.
6. Gaining rapidly.
7. Progressing quite distinctly.
8. Somewhat similar.
9. Very nearly the same.
10. No difference.
11. Rye grass very strong.
12. Like No. 11—have kept the same throughout to appearance.
13. A slight difference.
14. Somewhat the same.
15. Gaining considerably.
16. Nothing—the same as No. 1.
17. Clover looks beautifully, especially the white, which is thick and strong.
18. Considerably improved.
19. Keeping its position steadily.
20. Never changed colour, but getting stronger and closer.
21. Little difference, but close in the sward.

No. 22. A distinct difference.
23. No difference.
24. Making little progress.
25. A slight improvement.
26. Improving gradually.
27. A visible alteration for the better.
28. Rather sickly.

4th June.—Third Inspection.

No. 1. Nothing—suffering severely from the continued drought.
2. Looks beautiful.
3. The same as last.
4. Improving vigorously.
5. Made more improvement than many since last inspection.
6. Taking the lead decidedly—nearly all lodged.
7. Progressing visibly forward.
8. Continues nearly the same as last.
9. The same.
10. No difference from the unsupplied.
11. Pretty strong, and apparently weighty.
12. Pretty strong, and apparently weighty.
13. Good.
14. Good.
15. Rather better than Nos. 13 and 14.
16. Nothing—same as No. 1.
17. Clovers very strong.
18. Improving slowly but steadily, and threatens to lodge.
19. Improving steadily.
20. Appearances not in its favour, but, upon examination, excellent.
21. Steady improvement.
22. Greatly advancing in strength.
23. Evidently improving.
24. Improving daily.
25. A decided advancement.
26. Still improving over the unsupplied portion.
27. Improving slowly.
28. Still wears a sickly appearance.

18th June.—Fourth and last Inspection.

No. 1. Nothing—still suffering under the effects of the heat, much more than the others, and little benefited by the rains.
2. Improving beautifully—greatly lodged.
3. Nearly the same as last.
4. Improving quite magically—clovers most luxuriant.
5. Made more improvement than many since last inspection.
6. Keeps clearly a-head—totally lodged.
7. Still improving.
8. Nearly the same to appearance.
9. Nearly the same to appearance.
10. Little improvement if any.
11. Looks very well, nearly all lodged.
12. Looks very well, nearly all lodged.
13. Looks well.
14. Looks well.
15. Looks very well.
16. Nothing—same as No. 1.
17. Appears excellent, particularly the clovers, which are very tall and strong.
18. Still improves steadily, and greatly lodged.

No. 19. Improving steadily.
20. Appearances not flattering, but internally good.
21. A steady improvement.
22. Great advancement.
23. Considerably improved since last inspection.
24. Wonderfully improved—daily getting closer at bottom.
25. A decided improvement in appearance.
26. A great improvement.
27. Improving rapidly.
28. Continues to have a sickly appearance.

Mr Maclean next states the result of the application of some of the substances to a crop of oats sown upon old lea; but, as part of the crops were inadvertently cut in his absence, he could not ascertain the relative weights and produce; but he makes the following general observations on the state of the field at the time of the application of the substances.

He states that the field shewed symptoms of infection with grub, and that upon the worst parts he applied the manures. In a short time the field gave signs of recovery, and throughout the season, even during the excessive drought, made considerable advances over the undressed portions, except where the muriate of ammonia and gas lime were applied.

Application of Manures upon the Oats on old Lea.

The following top-dressings were applied to one-twentieth of an imperial acre, upon the 23d day of May, 1842, viz.:—

No. 1.	Carbon, at the rate of	4	cwt.	per acre.
2.	Sulphate of Magnesia	1½	cwt.	per do.
3.	Saltpetre .	1½	do.	do.
4.	Gypsum .	3	do.	do.
5.	Sulphate of Soda	1½	do.	do.
6.	Nitrate of Soda	1½	do.	do.
7.	Gas Lime .	2	do.	do.
8.	Salt . .	3	do.	do.
9.	Sulphate of Ammonia	½	do.	do.
10.	Guano . .	2½	do.	do.
11.	Muriate of Ammonia	½	do.	do.

Mr Maclean also transmitted to the society a table shewing the relative weight and value of a turnip crop grown with and without artificial manures. This table is also appended. The field which formed the subject of experiment, Mr Maclean states to be of the poorest description, "quite proverbial for producing inferior crops." In the year 1836, he top-dressed it with lime and earth, and kept it in pasture until 1841, when it was sown with oats, and produced a middling crop. The soil is thin blackish muir—subsoil, a muirband pan, nearly impenetrable. It was tolerably well drained, though by no means furrow-drained, still he was enabled to have it ploughed to a depth that had not been previously practicable. It will be observed, from an inspection of the tables, that the varieties of turnips experimented on were the yellow and globe—thirty cart loads of good farm-

yard dung being applied alone, and one-half that quantity, or fifteen cart-loads, being applied in combination with each of the fertilizing substances.

"The application of one-half manure, and four cwt. of rape-dust, produced five tons' weight of yellow turnip more than the full quantity of manure did, producing a gain of £4 : 14 : 8, after deducting £4 : 12s., as the expense of the application, estimating the price at 8d. per cwt.; and half manure, and 4 cwt. of salt, produced five tons and a-half more weight of globes than the full quantity of manure did, thus shewing a gain of £5 : 3s. per acre, after deducting £3 : 12s. as the expense of the application, the value of the globes being taken at 6d. per cwt."

Mr Maclean concludes by stating, with regard to his turnip crop, that it is most excellent; and that, while mildew and other diseases are reported to be destroying the crops of others, his, particularly those portions dressed with half manure and certain proportions of the other substances, shew an evident superiority both in size and foliage, and present such a healthy appearance as is rarely witnessed in ordinary seasons.

Table shewing the Relative Weight and Value of Turnips with and without Artificial Manures, in 1842.

No. of Portions.	Quantity of Dung and application of Manures per Imperial Acre.	Expense of Manure per Acre.	Weight of Yellow Turnips per Imperial Acre.		Weight of Globe Turnips per Imperial Acre.		Value of Yellow per Acre at 6d. per cwt.	Value of Globe per Acre at 6d. per cwt.	Total Value per Acre, after deducting Manures.	Gain by Application.	Loss by Application.
No.		L. s.	Tons.	Cwt.	Tons.	Cwt.	L. s. d.	L. s. d.	L. s. d.	L. s. d.	L. s. d.
1	30 Carts Dung @ 4/ per cart,	6 0	24	1			16 0 8		10 0 0	0 0 0	
2	15 Carts do. and Rape-dust 4 cwt. @ 8/ per cwt.	4 12	29	1			19 6 8		14 14 8	4 14 8	
3	15 Carts do. and Sulphate of Magnesia 1½ cwt. @ 14/	4 1	25	2			16 14 8		12 13 8	2 13 8	
1	30 Carts Dung @ 4/ per cart.	6 0			19	14		9 17 6	3 17 0	0 0 0	
2	15 Carts do. and Carbon 5 cwt. @ 4/ per cwt.	4 0			21	9		10 14 6	6 14 6	2 17 6	
3	15 Carts do. and Salt 4 cwt. @ 3/ per cwt.	3 12			25	4		12 12 0	9 0 0	5 3 0	
4	15 Carts do. and Sulphate of Ammonia ¾ cwt. @ 80/	6 0			19	3		9 11 6	3 11 6	0 0 0	0 5 6

Table shewing the Relative Weight and Value of White Globe Turnips per Imperial Acre, with and without Artificial Manures, in 1842.

No. of Portions.	Quantity of Farm-Yard Dung applied per Imperial Acre, with and without Manures.	Value of Dung per Imp. Acre.	Quantity of Artificial Manures applied.	Weight.	Value of Artificial Manure.	Weight per Acre.		Value per Acre at 6d. per Cwt.	Nett Value after Deduct. Value of Manures.	Gain by Application.	Loss by Application.
No.		L. s.		Cwt.	L. s. d.	Tons.	Cwt.	L. s. d.	L. s. d.	L. s. d.	L. s. d.
1	30 Carts Dung per acre @ 4/ per cart.	6 0	Nothing.	0	0 0 0	19	4	9 12 0	3 12 0	0 0 0	0 0 0
2	15 Do. do.	3 0	Sulphate of Magnesia.	2	1 8 0	19	10	9 15 0	5 7 0	1 15 0	0 0 0
3	15 Do. do.	3 0	Carbon.	5	1 0 0	21	9	10 14 6	6 14 6	3 2 6	0 0 0
4	15 Do. do.	3 0	Nitrate of Soda.	1½	1 17 6	21	5	10 2 6	5 5 0	1 13 0	0 0 0
5	15 Do. do.	3 0	Common Salt.	4	0 12 0	25	4	12 12 9	9 0 0	5 8 0	0 0 0
6	15 Do. do.	3 0	Sulphate of Ammonia.	¾	3 0 0	19	3	9 11 6	3 11 6	0 0 0	0 0 6
7	15 Do. do.	3 0	Gypsum.	3	0 12 0	18	15	9 7 6	5 15 6	2 3 6	0 0 0

Mr Maclean also applied various of the substances to his potato crop with the most evident advantage; but he could not overtake the requisite details so as to render them satisfactory to himself, or to be depended on by the agricultural community.

Mr Maclean's report was read at a monthly meeting of the Highland and Agricultural Society in the museum, but it was evident that the more minute details of such experiments could not be entered into within the short period of time which can only be allotted to each subject; some of the results, however, seemed so very striking, that Mr Graham of Redgorton and Mr Lockhart of Tarbrax, two of the directors of the society, went out on the 19th December, to see anything that might remain of the crops, and the general appearance of the farm in regard to soil, &c. These gentlemen were good enough to favour the directors with their observations, which, of course, at that late season, and the commencement of a fall of snow, could not be very numerous; but some of their suggestions were valuable, and have been acted upon.

They found, from the general aspect of the root of the clover foggage, that the crop must have been very abundant. Mr Maclean considered that the rent of that field, compared with the rest of his land, might be taken at 20s., while, in their observations, the gentlemen alluded to are inclined to state some parts of it at 30s., at least. This observation applies to the two ridges manured with farm-yard dung and salt. They state:—

"This plot certainly held an appearance of pre-eminence over the rest, but being at the end of the field nearest the house, and apparently old croft or infield land, and deriving more shelter than the others, from a stone wall shielding it from the Pentlands' northern blasts, we should not be inclined to consider that the superior results of a gain of £5 : 8 : 4 over that portion which had got no manure additional, afford safe data on which to pronounce that this preparation had so decided a preference over the others. It is also of some importance to notice that, in estimating the gains, rent has not been deducted."

They next proceeded to the field where there still remained some both of the globe and yellow turnip. They state that—

"It was quite evident that the crops had been excellent; the bulbs were of very adequate size, and Mr Maclean seems to have by no means sent in the largest of them as a sample—scarcely the average size. Mr Maclean assured us none of them had been mildewed, nor had they failed in the hearts; both of these rather general grounds of complaint this last season. The soil where these grew is by no means a good one, and though having a rise in the centre with a fall each way, was very wet from the recent rains; and, as it has not been furrow-drained, it owed the luxuriance of its crop very much to the peculiarity of last season."

Messrs Graham and Lockhart further state, that, on their suggestion, Mr Maclean has agreed to try, upon a larger scale, this season, those substances which proved most remunerating last one, and to mark, throughout a rotation of crops, the future effects upon any of the plots of ground, of those substances he has already applied, or may hereafter make the subject of experiment.

In conclusion, they further throw out a suggestion, the advantages of which are very obvious. They recommend that some member of the society should inspect the ground intended for experiment, *before* the application of the manures, at least *once more* during the progress of the crops to maturity, and *again* when under the process of being harvested; and that this should be imperative in all cases where any premiums of this description are offered by the society for competition; but that the report by such member should be separate and distinct from the report and minute details which must still continue to be supplied as at present by the competitors for the premiums offered by the society.

REPORT ON YOUNG PLANTATIONS, chiefly formed within the last Five Years, on the Estates of his Grace the DUKE of SUTHERLAND, in the County of Sutherland, under the Direction of JAMES LOCH, Esq., M.P.

[Premium, the Gold Medal.]

THE advantages of planting waste lands are now so fully understood and appreciated, that any enumeration of them is, in the present instance, deemed unnecessary; and, in the following report, it is therefore intended to limit the remarks as much as possible to the information requested by the Highland and Agricultural Society, under the different heads of expense; description of soil; ages and kinds of trees planted; number of each sort per acre; mode of planting; extent of beeting up; progress of the plantations; and general observations suggested by experience and present appearance of the plants, after prefixing a few separate notices relative to the different plantations.

The plantations newly or recently formed on the Sutherland estates, contain in all 2,091 imperial acres, of which 1859 acres have been planted within the last five years, or since autumn 1837, and the remainder at different times prior to that, and posterior to the commencement of 1836. These plantations occupy different altitudes, varying from 50 to upwards of 1000 feet above the level of the sea, and are situated in the parishes of

Golspie, Dornoch, Clyne, and Creich, on the north-west shore of the Dornoch Firth, and in the vicinity of the 58° north latitude, a district exposed to the sea-breezes off the Moray Firth, but possessing a comparatively mild climate, being defended from the more violent winds of the north and western oceans, by successive mountains and uplands of considerable elevation.

Separate Notices Relative to the Different Plantations.

1st, *Duchess Mound Plantation*, situated in the parish of Golspie, and within two miles of the sea. The soil, in part, consists of peat mixed with sand, and the remainder is a rich loam, lying on old red sandstone conglomerate, the general surface forming a steep slope with a southern exposure, and varying in altitude from about 50 to 150 feet above tide-mark In 1835, it was enclosed with a turf dyke, five and a-half feet high, by five feet wide at bottom, and one and a-half foot at top, the formation of which cost 2s. 9d. per lineal rood of six yards; and, as a further protection against the inroads of sheep, a single bar of paling was put on the top, the erection of which cost 1½d. per lineal rood of six yards. The dry nature and sloping form of the ground, rendered a less than average amount of drains necessary. These consisted of leaders and feeders; the former twenty-four inches deep, by thirty-six inches at top, and ten inches at bottom, the construction of which cost 9d. per rood; and the latter, nine inches deep, by twenty-four inches at top, and ten inches at bottom, which cost 3d. per rood. The whole was planted in autumn 1836, with two-year seedling Scots fir, one and two year transplanted larch, and one, two, and three year transplanted hardwood.

2d, *Drumdivan Plantation*, in the parish of Dornoch, and in the immediate vicinity of the sea, is sheltered on the west by old plantations; and throughout about two-thirds of its extent, consists of very light sandy soil on a sandy bottom, and is so level that considerable difficulty was encountered in getting it effectually drained. The remaining third is a dry sloping loose gravelly bank, and the whole is enclosed with a turf dyke of like dimensions with the last. In 1831 and 1832, the level ground was planted with larch, but with very indifferent success, from the want of sufficient draining; and, in 1836 and 1837, the whole was redrained and planted with two-year seedling Scots fir, one and two year transplanted larch, with a quantity of two-year transplanted elm and ash, on about two acres, which were formerly under culture.

3d, *Skelbo New Plantation*, in the parish of Dornoch, consists throughout of a light soil, on a gravel or clay bottom, with a

northern exposure, but sheltered by old plantations. The whole of the ground in this instance was formerly arable, and partly enclosed. In 1836 the enclosures were completed, and the whole planted with two-year transplanted larch and hardwood, chiefly oak, any failures among which were made up with two-year transplanted birch in 1840.

4th, *East Clashmore Plantation*, also in the parish of Dornoch, is situated about four miles inland, on a rising ground, attaining to an altitude of about 150 feet above the sea, having both a northern and southern exposure. The soil is in general of a light gravelly nature, occasionally mixed with peat or clay, and incumbent on a gravelly or clay subsoil; formerly about two-thirds of the whole was arable, and the remainder covered with black heath. In 1829 the latter portion was broken up with the plough, and sown with Scots fir seed, at the rate of 4 ℔ per acre, which proved an entire failure. The whole was surrounded by a dry stone dyke, five feet in height, the building of which cost 10s. per lineal rood of six yards; and, after being thoroughly drained, about one-half was planted in 1836 with two-year seedling Scots fir, and the other half with two-year transplanted larch and hardwood.

5th, *Black Park Plantation*, parish of Golspie, having a north and north-east exposure, is about a quarter of a mile distant from the sea, and from 100 to 350 feet above its level. The soil is in general light, resting on a loose sandy bottom, on red sandstone rock. In 1816 and 1817 it was sown with 4 ℔ of Scots fir seed per acre, which, however, afforded a very indifferent braird of young plants, and most of these perished in the succeeding winters; but the few which remained continued to do well. In 1838 and 1839 it was drained at a considerable expense, and planted with two, and a few three year seedling Scots firs, these being sorted into small, middling, and large sizes, and slit-planted into separate patches; the results of which were, that the large almost entirely disappeared within the first year. The middle-sized shewed a considerable portion of sickly plants, and the smallest proved the most healthy; part of both these last, however, died off in the course of the succeeding winter, and were again replaced with similar plants; and although both now appear very similar, yet the presumption is in favour of small plants, if healthy and well rooted, for exposed situations.

6th, *Badderhuie Hill Plantation*, in the parish of Creich, is situated on a hill ranging, in altitude, from 150 to 450 feet above the level of, and about twelve miles distant from, the open sea, having a northerly exposure. Towards the top of the hill the soil is light, partly on a hard clay or till, and partly on a gravelly subsoil; and on the lower parts it is chiefly composed

of a coarse loam or loam and gravel. The higher parts, which still bear the remains of an old Scots fir wood, was planted, in 1837 and 1838, with two-year seedling larch and Scots fir; and the lower grounds with two-year transplanted larch.

7th, *Duke's Plantation*, in the parish of Dornoch, contains a considerable diversity of soil, but it is generally of a peaty nature, mixed with a greater or less proportion of sand or gravel, and, for the most part, on a clay subsoil, but in some parts also on gravel—the former being usually underlaid by a stratum of hard till or pan. In altitude, this plantation varies from 60 to 200 feet above high tide-mark, and is situated about three miles from the open sea, with an exposure on all sides except the west. In 1833 and 1834 it was surrounded with a turf fence, and thereafter imperfectly drained and planted; but the results were in the highest degree unsatisfactory, until redrained with considerable care in 1838; and in that and the following seasons it was replanted with two-year seedling larch and Scots fir, one and two-year transplanted larch, and, in the best soils, 20,000 two-year transplanted spruce. Different portions were also planted with oaks, intermixed with birch, as nurses, the present appearance of which does not warrant a continuance of the practice, especially in such ungenial situations.

8th, *Duchess-Countess Plantation*, in the parish of Dornoch, has a southern exposure, with a thin light soil, and hard clay or gravelly subsoil, in the higher parts, and in the lower situations a loamy soil on sandy clay. It varies in elevation from 60 to 250 feet above high tide, and is about one mile from the sea. In 1838 and 1839, it was thoroughly drained, and enclosed on three sides by a turf dyke, (of like dimensions as described in No. 1,) and on the other side, where it is bounded by arable land, by a stone-faced dyke, five feet high, which cost 10s. per lineal rood; after which, in 1839 and 1840, it was planted with two-year seedling larch, Scots fir, and a few black Austrian pine, and one and two-year transplanted ash, beech, elm, and oak, with a few mountain ash, poplar, and alder.

9th, *Pole's Plantation*, adjoining the west side of the last—the higher parts of which it resembles in soil and exposure. About eighty acres of it were planted in 1834, but with very indifferent success; and in 1837 the same was replanted, and is now looking well. In autumn 1841, the remaining fifty acres were added to the enclosure, and thoroughly dried with open drains, as described in No. 1; and, in February last, this portion was slit-planted with three-year seedling spruce, and two-year seedling larch and Scots fir.

10th, *Evelex New Plantation*, in the parish of Dornoch, and

within a mile of the sea, contains about ten acres of level-lying light soil, on a loose gravelly bottom, and was planted, in spring 1841, with two-year seedling larch and Scots fir, in the proportions of about one-fourth of the former and three-fourths of the latter. It is sheltered by the old plantations of Sidera, in the vacant parts of which about 5,000 larch and 100,000 two-year seedling Scots fir have been planted within the last three years.

11th, *Kilcolmkill New Plantation*, in the parish of Clyne, and district of Strathbrora, about six miles inland, and from 50 to 150 feet above the level of the sea, is also in part sheltered by old plantations, and has a fine light soil on loose gravel, with a southern exposure, and was slit-planted with two-year seedling Scotch fir in 1840. On a large extent of ground adjoining this plantation, and protected from cattle and sheep by a four-bar paling, is growing a very fine and pretty regular crop of self-sown Scots fir, from the seed of the old plantations of Kilcolmkill.

12th, *Ben-Bhragie Plantation*, in the parish of Golspie, is situated on a hill of that name, fully more than a mile from the sea, and exposed on all sides, except small portions in the vicinity of old plantations, which occupy the lower grounds on part of the north-east and south sides. The elevation ranges from 200 to upwards of 1000 feet above high tide-mark. The prevailing rock is a quartzy red sandstone conglomerate, and the soil consists of almost all the varieties to be met with in the district. In 1840–1–2 the whole was planted with larch, Scots fir, spruce, silver-fir, and hardwood, consisting of oak, ash, elm, sycamore, Norway maple, hornbeam, mountain ash, poplars, &c., and, so far as can yet be judged, the silver-fir and Norway maple seem to withstand the sea-winds best; but it will still take some years before any definite opinion on the subject can be formed.

13th, *Harriot Plantation*, parish of Dornoch, is intended to comprehend about 680 acres, and lies on the top of a hill from 200 to 600 feet above the sea, from which it is distant about two miles. The prevailing rock is gneiss, and the soil consists in some parts of a poor thin peat on loose gravel and hard clay, in others of a sandy peat on gravel, and in certain localities of a thin poor loam on soft clay, &c. In 1841, about 240 acres were enclosed and drained, and in 1842 the same was planted with two-year seedling larch and Scots fir, one-year transplanted larch, together with a few three-year seedling and two-year transplanted spruce.

14th, *Mr Loch's Plantation*, in the parish of Dornoch, was enclosed and drained in 1841. A great portion of it lay formerly entirely under water, and, in some of the drier parts, considerable numbers of self-sown Scots firs have sprung up. At

present (autumn, 1842) the planting of it with two-year seedling Scots fir is commenced, and is expected to be completed before the end of December.

15th, *Sundries.*—Under this head are included several patches, varying from two to four acres in extent, which have been executed at a considerable expense, for the purpose of completing older plantations, or effecting improvements in the landscape, and which have chiefly been planted with large transplanted plants of almost all the different sorts previously enumerated.

TABLE 1—*Shewing the Expenses of Enclosing, Draining, and Planting.*

No.	Names of Plantations.	Dates of Planting.	Contents in Imperial Acres.	Enclosing.	Draining.	Planting.		Total.
						First Planting.	Beeting up.	
				L. s. d.	*L. s. d.*	*L. s. d.*	*L. s. d.*	*L. s. d.*
1	Duchess Mound,	1836	40	32 9 6	27 0 9	26 10 0	0 10 0	86 10 3
2	Drumdivan, . .	1836-7	100	62 10 0	4 14 0	17 3 0	not done	84 7 0
3	Skelbo, New, .	1836	20	40 0 0	2 0 0	34 14 9	1 0 0	77 15 9
4	East Clashmore,	1836	72	unascertained	7 0 0	45 14 0	none required	52 14 0
5	Black Park, . .	1838-9	144	do.	136 7 4	25 4 0	4 0 0	165 11 4
6	Badderhuie Hill,	1837-8	40	20 0 0	3 0 0	4 0 0	none required	27 0 0
7	Duke's, . . .	1838-9-40	300	149 7 0	72 3 8	71 0 0	not done	292 10 1
8	Duchess-Countess,	1839-40	230	193 8 11	49 19 7	102 15 0	6 0 0	351 3 6
9	Pole's, . . .	1836-42	130	102 2 4	24 0 0	85 15 0	none required	211 17 4
10	Evelex, New, .	1841	10	15 0 0	none	1 0 0	do.	16 0 0
11	Kilcolmkill, New,	1840	10	none required	none	1 5 0	do.	1 5 0
12	Ben-Bhragie, New,	1840-1-2	600	134 6 5	260 12 9	132 10 0	not done	527 9 2
13	Harriot, . . .	1842	240	160 0 0	77 15 1	48 10 0	do.	285 15 1
14	Mr Loch's, . .	1841-2	140	113 8 5	40 18 8	not done	do.	164 7 1
15	Sundries, . . .	1838-42	15	unascertained	unascertained	unascertained	do.	
			2091	Total ascertained expense,				2344 6 2

Expenses.—The outlay attendant upon the different operations of enclosing, draining, planting, and beeting up, (so far as the latter has yet been performed,) is exhibited in the foregoing Table No. 1. The value of plants being, however, subject to considerable fluctuation, and many of those used being reared on the property, their exact cost cannot now, from various causes, be distinctly ascertained; that portion of the expenditure is therefore entirely omitted. Parties desirous, however, of such information, may easily supply this apparent defect by taking the trouble to calculate their value at existing or given rates, with the aid of Tables Nos. 2 and 3, which contain the kinds and quantities used.

Description of Soil.—From the number and varied localities of the plantations, considerable diversity exists in their soils. These are, in general, however, incumbent on old red sandstone, gneiss, and gravel; of the latter of which, in their constituent parts,

they in general partake to a greater or less extent, with the exception of certain parts where pure moss or peat predominates, as is more minutely described in the separate notices relative to the different plantations.

Ages and kinds of trees planted.—The particulars relating to this head will also be found more fully stated under that of separate notices relative to the different plantations in Table No. 2, by which it will be seen that the kinds planted consist of larch, Scotch fir, Norway spruce, and hardwood of various sorts—as oak, beech, ash, elm, birch, alder, &c. The ages of these were, in general, as follows:—Larch, two-year-old seedlings, as also one and two year transplanted; Scots fir, two and three year seedling, and one and two years transplanted; spruce, two and three years seedling, and two years transplanted; and hardwood, either one, two, or three years transplanted.

TABLE 2—*Number of each sort Planted per Acre.*

No.	Names of Plantations.	Dates of Planting.	Contents in Imperial Acres.	No. of Plants per Acre.				Number of each sort in Plantations.				Total.
				Hard Wood.	Larch.	Scots Fir.	Spruce.	Hard Wood.	Larch.	Scots Fir.	Spruce.	
1	Duchess Mound,	1836	40	2500	3000	4000	3000	25,000	26,000	80,000	4,000	135,000
2	Drumdivan, . .	1836-7	100	2000	3000	4500	3000	4,000	84,000	292,400	6,000	386,000
3	Skelbo, New, .	1836	20	2300	3000	none	none	23,000	30,000	none	none	53,000
4	East Clashmore,	1836	72	2000	3000	4500	none	20,000	60,000	189 000	none	269,000
5	Black Park, . .	1838-9	144	none	none	5000	none	none	none	720,000	none	720,000
6	Badderhuie Hill,	1837-8	40	none	2000	4000	none	none	30,000	100,000	none	130,000
7	Duke's, . . .	1838-9-40	300	none	2700	5000	2700	none	200,000	1,100,000	16,000	1.316.000
8	Duchess-Countess,	1839-40	250	2500	3000	4300	3000	50,000	200,000	559,000	40,000	949,000
9	Pole's, ...	1836-42	130	none	3000	4000	2000	none	90,000	400,000	6,000	496,000
10	Evelex, New, .	1841	10	none	2300	4000	none	none	6,900	28,000	none	34 900
11	Kilcolmkill, New,	1840	10	none	none	3000	none	none	none	30 000	none	30,000
12	Ben-Bhragie, New,	1840 1-2	600	2500	3600	5000	3600	200.000	300,000	2,100,000	60.000	2,660,000
13	Harriot, . . .	1842	240	none	2600	4400	2600	none	230,000	616.000	30,000	876.000
14	Mr Loch's, . .		140	none	3600	4000	2600	none	none	none	none	unfinished
15	Sundries, . . .	1838-42	15	2000	none	none	none	30 000	none	none	none	30,000

Mode of Planting.—As a general rule, all seedling larches and Scotch firs were planted in the common or T slit manner, with the common garden spade; and, in certain situations, where the ground was of a tenacious or hard texture, slits were made thus ‡‡, for the purpose of loosening the soil, which practice has been found to produce a decidedly beneficial effect. For the transplanted larches, Scots fir, and hardwood, pit-planting was in general at first resorted to; but where such was practised in tenacious soils, many of the plants were found to be raised, and in not a few instances entirely thrown out by the frosts in winter; and even those which retained their hold were found to have suffered considerably from the water collecting in the pits, and

these acting as reservoirs in keeping it about their roots during wet weather; in consequence of which, slit-planting in one or other of the above-described forms was adopted in such soils, when the plants were not of too large a size for that operation; and, whenever carefully performed, the appearance of the young trees is decidedly in favour of such a practice. In some few places, where a stratum of muirband pan, or bog iron-ore, was found to exist between the soil and subsoil, a pick, constructed for the purpose, was used for breaking through the same, and stirring the subsoil to a depth of about six inches beneath. In such situations, the present appearance of the young plants is highly favourable; and the localities have been marked, with a view to ascertain the ultimate results.

Extent of Beeting up.—From various unforeseen causes, the extent of beeting up in the different localities has been very various; and the following Table No. 3, shews in how far this portion of the work has been completed; and, for additional particulars, see separate notices relative to the different plantations.

TABLE 3—*Shewing the Extent Beet up.*

No.	Names of Plantations.	Dates of Planting.	Extent in Imperial Acres.	Number of each sort used in Beeting up.				Remarks.
				Hard-wood.	Larch.	Scots Fir.	Spruce.	
1	Duchess Mound,	1836	40	...	...	10,000	...	Completed.
2	Drumdiven, .	1836-7	100	...	...	...	...	Not done.
3	Skelko, New, .	1836	20	3000	...	...	...	Completed.
4	East Clashmore,	1836	72	...	...	...	...	None required.
5	Black Park, . .	1838-9	144	...	...	80,000	...	Incomplete.
6	Badderhuie Hill,	1837-8	40	...	...	...	...	None required.
7	Duke's, . . .	1838-9-40	300	...	...	...	...	A good deal requisite.
8	Duchess-Countess,	1839-40	230	8000	30,000	...	...	Incomplete.
9	Pole's, . . .	1836-42	130	...	...	...	...	Not done.
10	Evelex, New, .	1841	10	...	...	...	...	None required.
11	Kilcolmkill, New,	1840	10	...	...	...	...	None required.
12	Ben-Bhragie, New,	1840-1-2	600	...	...	...	...	A good deal requisite.
13	Harriot, . . .	1842	240	...	...	...	...	Very little required.
14	Mr Loch's, . .	...	140	...	...	...	...	... ...
15	Sundries, . .	1838-42	15	...	...	...	...	None required.

Progress of the Plantations.—In so far as can yet be judged, the general appearance of the young plants is favourable, except on certain situations where the ground is still too wet, it having been found impossible to calculate exactly the effects of the drains at the time of their formation. In No. 1, the firs and larches generally look well; and a portion of the hardwood, which was cut down in 1839, continues annually to produce good healthy shoots. In No. 2, the small portion of hardwood has entirely failed, from the effects of drought; and in a part of

the lowest level ground, of very limited extent, the firs appear sickly, from a continued over-abundance of moisture. No. 3, the ground in which was formerly under cultivation, assumed a beautiful and regular growth the first season, which has ever since continued, thereby shewing the beneficial effects, on young plants, from having the ground previously prepared. No. 4 also presents a very satisfactory appearance, especially in the parts formerly arable. Taking the altitude and exposure of No. 5 into consideration, the general appearance of the young plants is satisfactory; and in the comparatively small plantation, No. 6, they are so in the highest degree. On about two-thirds of No. 7, the plants of all are doing well; but in the remaining portion, the ground is still much too damp, and is consequently to be redrained. In the higher parts of No. 8, the firs at first made but little progress, but are now doing better; and in the same plantation, the first planted larches suffered severely from hares, which have now been considerably thinned, and the trees they destroyed replaced. No. 9 now appears to be pretty effectually drained; and the plants put in last spring are looking well. Draining was at first deemed unnecessary in No. 10, the appearance of which is good, with the exception of a very small portion where a few drains will yet be required. In No. 11, the plants appear remarkably healthy, and in the large plantation, No. 12, the general appearance fully equals previously formed expectations; but from the diversity in its soil and altitude, as also in the kinds of plants used, considerable difference in the ultimate success of the trees may be looked for; and a further drainage must still be effected in certain parts. No. 13 having been planted last spring, it can only be remarked in regard to it, that the plants have in general held well, and from the favourable nature of the past summer, (1842,) they have made fully better than the ordinary length of shoots.

General Observations suggested by Experience and present appearance of the Plants.

In reference to the practice of sowing Scots fir seed, which was tried in 1816–17 and 1829, in Nos. 4 and 5, it may be remarked that the almost complete failure of these experiments seems attributable in part to the soil being of too wet and unequal a nature; and, further, to the liability of such soils, when ploughed or broken up, of casting or throwing out small seedling plants when acted upon by the winter and spring frosts. In confirmation of these remarks, it may be noticed that the soil on which the young self-sown wood is growing at Kilcolmkill, No. 11 is of a fine light dry nature, on a gravelly bottom; and that the young plants had the additional advantage of being protected from the rigour of winter by the short heath. In the dis-

tribution of the different kinds of plants, attention was paid to selecting for each sort the soils most congenial to its habits; thus larch is, in general, planted on the higher and dry grounds; Scots fir on those of a deeper and more moist nature, and spruce on the dampest, and such as contain a considerable proportion of peat in their composition; consequently they have the appearance of being distributed in irregular masses—a practice also in most instances adhered to in planting the hardwood.

For the purpose of facilitating the after removal of thinning and other timber from the larger plantations, as well as for admitting free access to them at all times, roads and drives have been left throughout at convenient distances; experience having shewn that when the formation of these is delayed till required it is then scarcely possible to select the most eligible situations, especially on ground where the surface is naturally much varied. The extent of Ben-Bhragie plantation, No. 12, conjoined with the unusual diversity of soil, altitude, and exposure which it presents, points it out as being especially suited for the formation of an *arboretum*, and it is, therefore, in contemplation, in furtherance of the views of the Highland and Agricultural Society, as detailed in their list of premiums for the present year, 1842, (Class viii. No 7,) to form upon it a collection of the forest and ornamental trees capable, or supposed capable, of succeeding in the climate of North Britain.

ON PROTECTION FOR SHEEP.

I.—By Robert M'Turk, Esq., Hastings Hall, Dumfriesshire.

The practice of affording protection to sheep against the severities of the climate, in cold and exposed districts, is as old as any of those other expedients which man has found it necessary to adopt for the preservation and improvement of so valuable an animal. After exhausting every practicable means of yielding protection and shelter, by the erection of stells, &c., it was still found that some more constant and effectual method was necessary, and salving was resorted to as the cheapest and most likely way of attaining three important objects—namely, to defend the animal from the cold, from the ravages of the scab, and to destroy the vermin which the heat of the summer and the warmth of the fleece have alike a tendency to produce.

With regard to all these objects, it has, to a certain extent, been found to answer the end in view. The expense of the materials, however, and the tinge communicated to the fleece by

the tar, which unfits it for taking on the more delicate dyes, has long been regarded as a serious drawback upon the use of them.

It has long been known to those interested in the management of sheep, that a greater amount of protection is given by *bratting* than by the application of any salve; but, till of late years, it was always considered necessary to smear at the same time, in order that the vermin might be destroyed. The expense of adopting this double process was too considerable to admit of a profitable return. There was likewise another difficulty connected with bratting which rendered it exceedingly inconvenient and unpopular. The practice was to sew the brat to the wool of the animal, which, in hands little accustomed to the use of the needle, was both awkwardly performed, and attended with great trouble and loss of time. It was also very inefficient; for the wool to which the threads were attached was liable to be pulled out, and, when one part of the brat got loose, it tended to detach the other parts; while, if the sheep happened to be attacked with scab or vermin, it seldom failed to displace its covering, by rubbing against almost every object that came in its way. Even a more frequent cause of displacement arose from the shedding of the wool in spring, especially if the sheep happened to be in a reduced condition. All these were serious disadvantages, and decided objections to the practice, as formerly followed. At the present time, however, these and other difficulties may be more easily overcome than at any former period.

Never could cloth be obtained at so cheap a rate, while, at the same time, substances have been discovered which effectually destroy vermin, and completely obviate the necessity of smearing, at not more than a halfpenny per head, or 1-10th the expense of smearing. Cloth, very well suited for the purpose, may be made from the refuse wool of carpet manufactories, equally thick and warm as a blanket, and this can be got for 6d. per yard. If cloth, such as sacks are made of, be employed, it may be had for 4d. per yard.

When intended for bratting hogs, it should be three-quarters wide, and two feet of such cloth will be sufficient for covering one hog. When intended for old sheep of the best description, the brats may be made larger by applying the cloth the long way, and we have then twenty-seven inches of width to cover the back and side instead of twenty-four, and it can be cut off as long as the largest sheep will require. The brat should always come as far down the sides as to cover the widest part of the ribs, and all the back, from the tail to the back of the neck. The best plan is to select a sheep from the flock, of an average size, and measure the quantity of cloth required for it.

When the cloth has been applied to the animal, and its proper

dimensions ascertained, the parts should then be marked to which the different straps and strings are to be sewed to hold it in its proper place. A strap must then be fixed to one of the front corners in a diagonal direction, so as to pass beneath the throat, and sewed to the other corner after it is put on, in the same way as the other straps which are intended to pass through beneath the legs; these must be sewed only at the one end, till the covering be put upon the sheep, and then the other end can be sewed so as to make the brat fit. These straps should be of some soft material, that they may not chafe or injure the skin when the sheep is in motion. If, when made, the brats are dipped in coal tar, it will enable them the better to resist the wet, and prevent them rotting. If taken care of, they will answer the end for five seasons. They ought to be made early in summer, in order that the tar may be dried before the time of using them arrives in November. They ought not to remain on the sheep any longer than the beginning or middle of April, according to the state of the weather and the condition of the flock at the time. We recommend that considerable care should be bestowed in attaching the strings to the proper places in the one first made, so that it may fit well, as it is to serve as a pattern to make the others by. A person who is accustomed to the use of the needle mill make one in five minutes, and it may be put on in less than other five.

A brat of woollen cloth with the string will not cost more than 5d.; and one of the flaxen ones about 3½d.; but the former will last longer and answer the end better. In order to prevent them being stolen, and to enable the shepherd to distinguish the flock under his charge, they should be all marked with the buisting iron dipped in white paint. Some days before the brats are put on for the winter, the sheep must be poured with some one or other of the bathing mixtures to destroy vermin.

Some days after this process, when the wool has regained its usual appearance, the brat should be put on; and the mode in which we recommend this to be done completely obviates the inconveniences arising from the method which has hitherto been practised of sewing it to the wool; for it will be observed that it is wholly attached to the body, and not to the wool, and it therefore possesses this decided advantage over the old method, that it cannot be rubbed off, while, at the same time, it preserves the wool from being so, in case of the pile getting weak from disease or from low condition. We have found, from our own experience, and we have never heard the fact doubted by any one conversant with the management of sheep, that no salve which has hitherto been tried will afford a degree of protection equal to bratting, when it can be sufficiently secured on the ani-

mal. We are therefore entitled to conclude that, by this treatment, the flock will be in higher condition, and if so, the clip of wool will be greater, and the loss by death considerably diminished. When the brat is taken off in April, the wool will be found to have retained the *yolk*, and will appear quite yellow. When examined, it will be perceived to be sappy and sound, and quite free from the defect that wool staplers call *hasky* and *pinnay*, (*i.e.* dry and brittle,) which occasions much loss in the manufacture. When washed, its natural whiteness is quite unimpaired, we would even say increased, from the soap which had been used in pouring and the yolk which is retained.

Notwithstanding the advantage which sheep have been found to derive from these artificial expedients, much still can be done to promote their comfort and condition by a more intelligent attention on the part of the breeder to the character of the fleece, and, in this way, making the flock in a greater degree supply protection for itself.

Of the varieties of fleece which are preferred, we shall notice, *first*, the long, loose, open, lingly fleece which has been gaining ground for the last ten years; and, next, the close fleece, which, twenty years ago, was more generally in request. The only advantage which the former description of fleece possesses over the latter is, that it gives the animal a more showy and bulky appearance, particularly in dry weather, when the piles are tossed about by the wind; but when wet, it does not possess even this slight advantage, but, on the contrary, gives the animal a more comfortless appearance than the less showy but more close and serviceable fleece.

The same partiality for the long and open fleece prevailed for a time among the breeders of the Leicesters; but the error has been discovered, and now no breeder of any note of that description of stock will lift his voice in defence of it; and there cannot be a doubt that a few years' more experience of it, particularly if the winters are severe, will convince the breeders of Black-faced stock of the impropriety of the preference. Indeed we have never met with any store-farmers who will maintain that the open fleece will enable the animal to maintain its condition equally with the close one. The latter, in wet weather, retains the globules of rain upon the top of the fleece, till the animal shakes them off; and it is only in very heavy showers that the fleece allows the rain to penetrate to the skin; but before the open fleece is charged with rain, a shed or opening is formed all the way along the back of the animal, and the rain is thereby allowed at once to find access to the skin, along the surface of which it is conducted; and it cannot then, as in the former case, be shaken off. The same objection applies when

there is a fall of snow, but the evil in this case is of a more aggravated character; for the shed in the fleece along the back is often filled with snow for a whole day together. Now is it possible that anything could be more injurious to the health of the animal, or more likely to occasion disease, than that one of the most vital parts of the system, namely, the spine, along which the circulation is conducted, and from which the nerves emanate, should be thus so frequently exposed to the chilling influence of wet and cold for days together? There is another very serious evil attending the kind of fleece in question, namely, that after the snow has fallen, the ground drift prevails to a very formidable extent; and it is from this kind of drift that the store-farmer has to apprehend most danger to his flock, inasmuch as in nine cases out of ten it is by the rieves of snow thereby accumulated that his flock is overwhelmed; and although the drift may not prevail to a very alarming extent, yet, as the animal seeks food or shelter, or in any way alters his position with regard to the storm, or as the wind swirls from one inequality of the surface of the ground to another, or as the animal encounters a different current of the blast, one part of its loose fleece is lifted after another, and thus everywhere the snow and wind find access to the skin, till each portion of the fleece is drifted full of snow.

After what has been said, it must, I think, be evident to every one how much these circumstances tend to endanger the life of the animal; but there is another point which may not be so very obvious, but which must not be overlooked, in the open and long-woolled sheep, namely, that they have not the same tendency to get fat—from what cause I pretend not to explain—but the fact is fully established; and were a flesher to be permitted to single out a sheep from a lot without having regularly handled them, his choice would almost always fall upon a sheep close and thick in the coat. But be this as it may, what I affirm is, that a close fleece is better adapted for retaining, in winter, the amount of condition acquired in summer, and the sheep possessing it are thereby a degree in advance in spring.

It is also contended, on the other hand, that the more open fleece is, in general, longer in the pile, and, therefore, that it will yield a greater clip, and that the high prices which have, of late years, been obtained for wool, sufficiently justify the preference which has been given to the sheep which yield it. My experience has led me to an opposite conclusion, and I have almost invariably found that the little additional length which is sometimes found in the more open fleece, is more than counterbalanced by the greater number of piles in the close one, and their superior fineness.

The system of bratting, which I have endeavoured to point

out, is one which we have tried, and can, with confidence, recommend. It is alike calculated to preserve the flock in higher condition and the wool from deterioration, and also to afford the means of bringing some of the more reduced of the eild ewes through the winter, which could not otherwise have survived in a high and exposed district.

Brats.	Price.	Duration.
Brat marked A,	5d.	5 years.
Larger size, B,	6d.	do.
Flaxen, D,	3½d.	2 years.
Pouring with bath mixtures,	½d.	1 do.
Smearing,	5d.	1 do.

ON PROTECTION FOR SHEEP.

II.—By Mr ROBERT BOYD, Marmion Place, Innerleithen.

IT has been for a long period an object of great desire, among store-farmers in Scotland, to obtain salving mixtures of such a nature that they will not only protect their flocks from the severities of our climate in exposed situations, but tend, at the same time, to produce a fleece of the best description. Many of the substances formerly employed for these purposes have been found insufficient; and, although important improvements have recently been made, we are still far from having obtained the desired object. The application of cocoa and gallipoli oils, in particular, is objectionable, as, in consequence of their easy liquefaction by the heat of the animal's body, they soon find their way from the roots to the top of the wool, where they form, along with the turpentine with which they may have been mixed, a hard-crusted substance, highly injurious to the fleece. As a remedy to these and many other evils incident to the prevailing modes of salving sheep, Mr Ballantyne of Holylee, a zealous labourer for the improvement of the fleece, has, for the last two years, salved his flocks, which amount to upwards of 163 scores, with the following composition:—

30 lbs of butter,	5d.	£0	12	6
14 .. rough turpentine,	1½d.	0	1	9
3 .. black soap,	4d.	0	1	0
2 .. soda-ash,	1d.	0	0	2
5 bottles refined spirit of tar,	7d.	0	2	11
		£0	18	4

To this 21 pints of water are added, to assist in the equal spreading of the mixture.

The above composition is found sufficient to salve 100 sheep, which is at the rate of 2¼d. a-head. It requires to be applied to the fleece at a temperature a little above blood-heat.

When we consider the chemical nature of this composition, it will appear that the most appropriate name which can be given to it, as a new salve, is *Artificial Yolk;* for it is of the same nature, and possesses the same properties, as the natural yolk existing in the wool. It is known that the conducting powers for heat, both of animal and vegetable oils, are very materially diminished when saponified; this is owing to the compound being thus rendered porous. The soda-ash contained in the above composition has the effect of saponifying the whole mass, consequently, the conducting power for heat of the animal oil contained in it is greatly diminished, and a degree of comfort obtained for the animal to which the composition is applied which could not result from the use of oils which had not undergone the process alluded to. It was supposed by some that, owing to the saponaceous nature of this composition, it would, in some measure, be liable to be washed off by rain. This, however, has been proved not to be the case; for it was found, on the strictest examination, that no aqueous matter had been able to penetrate the fleece during its growth.

Mr. Ballantyne considers the artificial yolk salve decidedly superior to any other he has ever used as a defence to the sheep. In addition to this, it is calculated, in my opinion, to produce a fleece unequalled in the history of salves. In this estimate of its value, I have the concurring testimony of Mr Barff, wool-stapler, Wakefield, whose extensive experience entitles his opinion to great weight. He has been the purchaser of Holylee clip for the last twenty years; and he affirms that the salve used by Mr Ballantyne for the last two years has had the effect of producing upon the fleece an indescribable kindliness to the touch, and that its felting properties were also very materially improved. In consequence of these advantages, he has allowed Mr Ballantyne the highest price he gives for the purest unlaid wool, which is the best evidence that can be adduced of his high opinion of its value. It may be further added, that the opinion of the English wool-staplers appointed to decide upon the merits of the Leicester fleeces, shewn in competition at Edinburgh, in 1841, was expressed in terms of commendation in reference to the fleeces in question.

It is a fact familiarly known to those experienced in the smear-

ing of sheep, that when animal oil forms any part of the salving mixture, it rarely fails to leave a stain upon the wool. During the last two years it has been proved to demonstration that when animal or vegetable oils have been saponified previously to being applied to the sheep, they act as a total preventive of the discolouration of the fleece during its growth. It must also be consistent with the knowledge of manufacturers that, when a few fleeces which have been saturated with natural or artificial yolk are thrown into a batch of clean wool, they never fail to prevent it *gilting*, or assuming a yellow tint of colour during the process of manufacture—a result at all times much to be desired.

It has been sometimes asserted that salving does not promote the growth of wool. My own experience, derived from a close attention to the subject for a period little short of fifty years, convinces me that, in manufacturing from a mixed clip of wool, (that is to say, wool which is partly salved and partly unlaid,) if the same quantity of each kind were reduced to the same degree of cleanness by scouring, there would be found a great preponderance in favour of that which had been salved. Moreover, owing to the sapless brittle nature of a portion of the unlaid wool, it is liable to much greater loss while in the course of preparation, owing to the friction of the machinery, than that which has been salved. It will, consequently, be found that, from a given quantity of salved wool, a greater number of pounds of clean yarn can be obtained than from unsalved, a result to be ascribed to its greater pliability and soundness of staple. When manufactured into any description of cloth, in which the felting properties are called into operation, the superiority of the salved wool will be still more strikingly displayed, as the cloth will not only be finer, but better in other respects than that made from unsalved wool.

Some years ago, I had an opportunity of conversing on this subject with a Spanish shepherd, who had been brought to this country by the late Earl of Leicester. When in Spain, he had the charge of a numerous flock of the finest description of merinos. He stated that the moment the shepherds discovered that any of the fleeces were, in the least degree, scantily supplied with yolk, an artificial salve was instantly applied. Of the ingredients composing that salve he unfortunately knew nothing. He added that, when any portions of the flocks that were scantily supplied with yolk happened to escape notice, the fleece, at clipping time, was found to be not only inferior in quality, but considerably *deficient* in quantity.

Mr Youatt, the compiler of the volume on sheep in the Library of Useful Knowledge, asserts that the felting properties depend

entirely on the *structure* of the wool. My own experience leads me to believe that this is not the fact; and, in corroboration of my opinion, I may state that a small quantity of merino wool, the first clip after the sheep were imported into this country, which was manufactured under my own immediate superintendence into cloth, was found, on account of the felting properties *it then possessed*, to be admirably adapted for that purpose. The very second year, however, the felting properties began to fall off, and that to such an extent that the wool was found unfit for the fabrication of any description of goods in which milling properties were required. Samples from the first, second, third, and fourth years' clips were carefully examined through a microscope, under the skilful management of an eminent optician, and he declared that there existed not the slightest difference in the structure of the respective specimens. It was obvious, however, even to the unassisted eye, that the sample from the first clip had been much more copiously supplied with yolk than any of the others, and to the diminution of this secretion I attribute the falling off in the felting properties. From this instance, as well as from many others which might readily be adduced, I have no hesitation in asserting that, in many cases, it is utterly impossible to estimate the milling properties of a variety of wools until they are submitted to the test of actual experiment. I am, therefore, decidedly of opinion that, however perfect the structure of wool may be, yet in the absence of a saponaceous substance, it cannot possibly possess, in an eminent degree, the felting or milling properties requisite for a clothing material.

DESCRIPTION OF AN IMPROVED TURNIP-SOWING MACHINE
invented by Mr Geddes, Cargen Bridge, Dumfriesshire.

Mr Geddes first made public his improvement on the turnip-sowing machine in 1837, at the society's general show in Dumfries, and a premium was then awarded for an improvement in the seed-distributer of the machine. At the general show in Berwick in 1841, he again exhibited a still further improved sowing-machine for turnip, along with a broad-cast grain sowing-machine, for the latter of which he then also obtained a premium, and, at the same time, the judges recommended that a model of the turnip-sower, with the additional improvements, should be placed in the museum. The model has accordingly been furnished by Mr Geddes, and from it the annexed cuts have been drawn.

Fig 1.

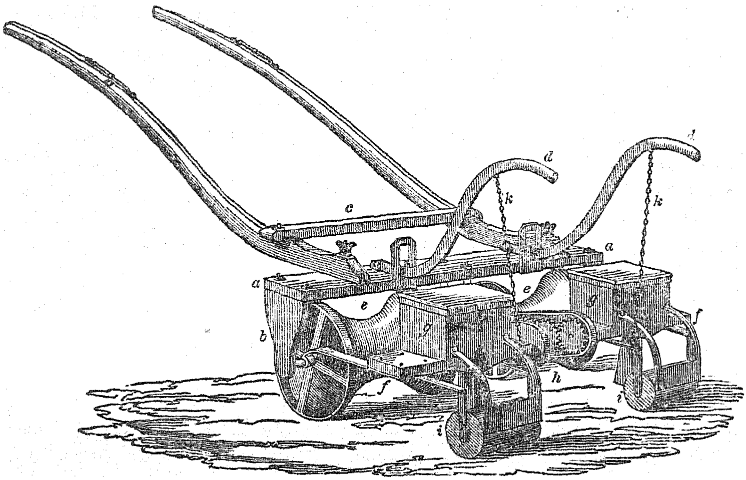

Fig. 1 is a view of the machine in perspective, and, as will be seen, it resembles, in the general configuration, the common two-drill machine now in very general use. The improvements in the machine here represented do not lie in the general construction, but in the mode of distribution of the seed, and in that of communicating motion, from the rollers in which the machine moves, to the distributer. In the figure, *a a* is a bed-plank on which all the other parts in the construction are dependant; *b* is an inverted standard attached by bolts to the bed-plank, and having its fellow at the opposite end, though not seen in the figure; *c* are the horse-shafts, and *d d* the handles; the former bolted to the bed-plank, the latter jointed to it, and at liberty to rise and fall, guided by the sheers affixed to the hind edge of the bed-plank. The curved rollers, *e e*, on which the machine travels, are, as usual, sixteen inches in length, fourteen inches diameter at the ends, and diminish to eight inches in the middle; they are of cast iron, with cross arms at each end, and have a rod or axle, common to both, passing through them and the standards *b*; a pendant iron V stay supports the middle of the axle, and the length of the bed-plank and the axle is such as to afford space for the rollers to shift to right or left, accommodating themselves to the varying width of the drills. The seed-box frames, *f f*, are also appended to the axle, and move laterally with their respective roller, the seed-boxes, *g g*, being placed on a small platform attached to the arms, *f f*, of

the frame. The motion which the rollers, *e e*, acquire by the movement of the machine is communicated to the seed-distributer through a train of small wheels, part of which, for the off-side frame, are seen at *h* uncovered. These wheels are enclosed in a case, to prevent earth from falling into their teeth, which might thereby derange their proper action. The first wheel of each train is connected with the end of its roller, and the last is placed upon the axis of the distributer. A small roller, *i i*, is attached to each frame, generally used only for the purpose of giving a slight cover to the seed; but in this machine they serve also as regulators of the depth to which the seed rut is formed, and for this purpose provision is made for their being raised or lowered by shifting their axes, and the yare provided with scrapers to remove any adhering earth. Immediately in front of these rollers are seen the coulters that form the rut in which the seed is deposited, the seed having passed from the distributer through a directing tube which is sheathed in the coulter, whereby the seed is securely deposited in the soil. The seed-box frames are attached to the handles, *d*, by a chain, *k*, by which means they can be lifted from the ground at pleasure.

Fig. 2.

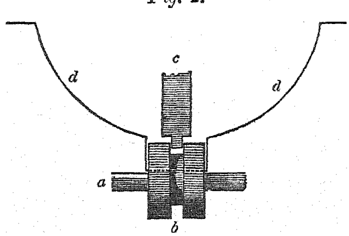

Fig. 2 is a vertical section, in outline, of the seed-box, with a view of the distributer; *a* is the axis of the distributing roller, which is of brass, and about one and a-half inch diameter, having a groove, *b*, of one-tenth inch wide, running round it; a slider, *c*, has a tongue adapted to fit into the groove, and is fixed by means of a screw to suit any required quantity of seed that it may be desirable to sow per acre; the quantity of seed distributed being proportioned to the extent of opening left between the point of the tongue and bottom of the groove. The curved lines, *d d*, with their termination, exhibit an outline of the interior surface of the seed-box, which is a semi-cylinder, of seven inches diameter, and five inches in length.

The chief points of difference between this and the most commonly-used two-row drill, are the seed-box and distributing roller, in place of the tin-plate seed-barrel, and being driven by wheel geering instead of chains; but, in respect of the latter, the wheel-geering has been long in use, though, from its greater complication, it has never become so common as the chain. In the present form, the casing of the wheels is an improvement, but it is gained at some expense. The mode of attaching the cover-

ing-in rollers in this machine differs from the common form in this, that they partake of a permanent character, and bear a considerable share in regulating the depth of the rut made by the coulter, as the rollers have a provision for shifting up and down according as greater or less depth may be required. In general, such rollers are seldom used for the purpose of covering the seed; and in such cases, the chains, *k*, are made inflexible rods, that can be lengthened or shortened, to regulate the depth of sowing. It may be remarked, indeed, that when the machine is working properly, the aid of the covering-roller is not required, unless to consolidate the soil about the seeds; but as a regulator of depth, its services may be more important, and deserving of the attention of agriculturists and machine-makers.

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ON THE FEEDING QUALITIES OF THE NATURAL AND ARTIFICIAL GRASSES IN DIFFERENT STATES OF DRYNESS.

By James F. W. Johnston, F.R.S.L. & E.

Much knowledge remains yet to be acquired in reference to the most economical mode of using green crops as food for cattle. It is true that there exists much valuable information *floating* among intelligent practical men, but when the unprejudiced inquirer begins to collect, with the view of *fixing* this floating knowledge, he meets with opinions so contradictory, even from men of equal intelligence and skill, that he must be well acquainted with those causes which affect the results of agricultural operations in different localities before he can hope to approach the truth, or to extract anything like general principles from the testimony of practical men alone. The opinions of practical agriculturists are derived in general from their own experience, and from that of their neighbours, in a limited district only. In distant parts of the country, we know that these opinions are often quite opposed to each other; yet the phenomena from which the cultivators of each province have deduced their opposite opinions, are the natural results of the same general laws. It is these laws which the philosophical agriculturist seeks to discover.

The above observations apply, among other topics, to the opinions held in different localities in regard to the relative feeding properties of the natural and artificial grasses in their green and dry states—their relative value when made into hay after one or another method, and when used at one or another season of the year.

1°. It appears to be generally conceded that soiling is much more profitable than pasturage—that an acre of meadow, for example, will feed more stock if the grass be cut and given to the cattle under cover than if they be turned out to crop it for themselves. It is even said that the produce of "one acre of grass when soiled will go as far as four acres when pastured, and that, in this way, one acre of clover is equal to six of meadow pasture."* Whether the difference will always be so great as this, we may be allowed to doubt; yet, supposing it to be really the case, we can, in some measure, account for it, or understand from whence the difference proceeds. For, in the first place, cattle are known to eat less—indeed all animals do so—when

* British Husbandry—vol. i., p. 139.

they are kept from the open air and are deprived of natural exercise. In the same circumstances also, they fatten more quickly, or increase in weight more rapidly, in proportion to the food they eat. In the second place, the quantity of grass produced by a young plant or shoot, in a given number of days, is less when it first comes forth than after it is some way advanced towards maturity. It is when the leaves are fully expanded that it is able to draw the largest supply of nourishment from the atmosphere in a given time, and, consequently, to increase most rapidly in weight. But when cattle are turned into a pasture, it is the young shoots which they delight to crop—thus cutting them down before they have attained to their most rapid period of growth. But if the whole be cut down and soiled, the stock have no such choice, they must eat the whole grass as it is given them; and the young blades in the field have leisure to expand and grow again before the scythe returns to cut them down a second time.*

2°. But it is also said—and I believe, as a general principle, is also conceded—that the same weight of the same grass will go further in the green state than when it is made into hay. But there appears to be a great, and, so far as I am capable of judging, a well-founded difference in regard to the amount of nourishment lost by the act of drying. By some it is stated to amount to one-half; a ton of green rye-grass or clover going as far as two tons when made into hay. This proportion cannot be general; but since differences so great may exist, according to the evidence of practical men, it becomes a matter of interest to inquire how this difference arises, and if by any means it can be avoided or diminished. When we consider how much of the land is annually under natural or artificial grasses, which are afterwards to be converted into hay, it will appear to be a matter of no small moment if the feeding property of the whole, by some improvement in the mode of preservation, can be increased to the amount of even one-tenth or of one-twentieth only.

When the soft young shoots of the dog-rose, the bramble, or the hawthorn, or the stem of the young cabbage, are cut off and peeled, they are found to be soft and eatable, and, like the heart of the young turnip, are readily digestible; but let a month or two elapse, and these shoots become woody and unfit for mas-

* For the same reason, a field is less economically grazed when overstocked with cattle, which keep the whole field closely cropped, than when grazed by such a moderate number as will allow the young shoots some days to grow before they are again cut off. A greater number of days' feeding will be obtained from the same field by the latter method. This will be more especially the case with sheep, which bite so close to the ground.

tication, and, when taken into the stomach, pass through the intestines of most animals in a great measure unchanged. Thus animals which thrive on the young shoots of early spring, can with difficulty sustain themselves on the more matured branches of the advancing summer. The reason of this difference is, that the starch and gum, and similar soluble and digestible substances of which the young shoot consists, are gradually changed into the insoluble and, in general, almost indigestible woody fibre of which the stem and branches of the mature plant are in great part composed.

When green grass or clover, approaching to maturity, is first cut down, it contains a considerable proportion of starch, sugar, and gum, still unchanged into woody fibre, as it would mostly be were the plant allowed to become *fully* ripe. But when left to dry in the open air, the circulation proceeds to a certain extent, and, under the influence of light, woody fibre continues to be formed in the upper part of each stem, until it becomes completely dry. It may even be a matter of doubt whether this process of change does not often proceed after the hay has been carried off the field and stacked. The effect of this change will obviously be to render the dry hay less digestible on the whole, and, consequently, less valuable as food than the green grass from which it was prepared.

Again, we know that, by drying, many very digestible and nourishing substances become less soluble, and, consequently, more difficult of digestion. The stomach of a growing animal cannot afford the time necessary to the complete digestion of such dry substances, and hence a larger portion of the really nutritive matter of their food is rejected in the droppings of animals which are fed upon them. How much of dry corn escapes half digested from the stomach of the horse—how much, probably, of the animal matter of the bones it eats, from the stomach of the dog—which either of these animals would have been able fully to digest, and to work up for its own sustenance, had the food been presented to it in a less hard and solid state! So it must be, to a certain extent, with dried hay. What was easily soluble and digestible in the green, has, without undergoing any chemical change, become less soluble and more tardily digestible in the dry, and hence a second reason why the hay should afford less nourishment than the grass from which it was made.

3°. The knowledge of these two causes of deterioration suggests the kind of inquiries which the practical farmer ought to make, and the kind of practice he ought to adopt, in order to retain as much as possible of the feeding property of his grass and clover crops, and thus to turn to the greatest advantage the

annual produce of his land. Thus he may ask—Is it possible to preserve these crops in their moist state? Can I cut them down and so preserve them undried, as to obtain from them, for my cattle, an amount of food more nearly equal to that which the fresh cut grass is capable of affording? A method has lately been tried in Germany, which, by the aid of a little salt, seems in a great measure to attain this object. Pits are dug in the earth from ten to twelve feet square and as many deep; these are lined with wood, and puddled below and at the sides with clay. They may obviously be made of any other suitable dimensions, and may be lined with brick. Into this pit the green crop of grass, clover, or vetches, is put just as it is cut. Four or five cwts. are introduced at a time, sprinkled with salt, at the rate of one pound to each cwt., and, if the weather, and consequently the crop, be dry, two or three quarts of water to each cwt. should be sprinkled over every successive layer. It is only when rain or a heavy dew has fallen before mowing that, in East Prussia, this watering is considered unnecessary. Much, however, must depend upon the succulency of the crop. Each layer of four or five cwts. is spread evenly over the bottom, is well trodden down by five or six men, and, especially, is rammed as close as possible at the sides with the aid of wooden rammers. Each layer is thus salted, watered if necessary, and trodden in succession, till the pit is perfectly full. Much depends upon the perfect treading of the grass for the exclusion of the air, and, therefore, for a pit of ten feet square, four cwts. are as much as ought to be put in for each layer. Between each layer may be strewed a few handfuls of straw, in order that, when emptying the pit afterwards for the daily consumption of the stock, the quantity taken out may be known without the necessity of a second weighing. When the pit is full, the topmost layer is well salted, the whole then covered with boards, or a well-fitting lid, and upon these a foot and a-half of earth, for the more perfect exclusion of the air. A pit ten feet square and as many deep will hold about five tons of fresh grass, and each pit should, if possible, be filled in not less than two days.

When covered up, the grass speedily heats and ferments, and, after the lapse of about six days, when the fermentation has ceased, the whole has sunk to about one half of its original bulk. The lid must be examined during the fermentation, at least once a-day, and the earth, as it sinks, carefully replaced wherever crevices appear; for, if the air be allowed to gain admission, a putrefactive fermentation will come on, which will impart a disagreeable odour to the fodder, though it will not prevent it from being readily eaten by the stock. When the first fermentation has ceased, the lid may be removed, the pit again filled with fresh grass, trodden in, salted, and covered as before. A pit ten

feet square, when perfectly full of this fermented grass, will contain nearly ten tons—equal to two or three tons of dry hay. The grass, when thus fermented, *has the appearance of having been boiled*, has a sharp acid taste, and is greedily eaten by the cattle. The pits should be kept covered for, at least, six weeks, after which they may be opened successively as they are required, and may be kept open till their contents are consumed by the cattle without suffering any injury from the contact of the atmospheric air. Of the feeding qualities of this salted fodder, one experimenter says that, by giving only twenty pounds a-day of it along with chopped straw, he kept his cows in condition during the whole winter. His green crop was vetches, and the twenty pounds of salted fodder were equal to, or would have made, less than four pounds of vetch hay. Another experimenter says that, on a daily allowance of twenty-eight pounds of his salted fodder, his cows gave a rich and well-tasted milk.*

This method of salting and preserving green crops in their moist state, appears to afford an answer to the first question which is naturally asked when we are told of the difference in feeding value between the same grass when first cut and when dried into hay. It is probable that the fermentation which takes place in the pit may in some degree diminish the nutritive value of the grass, but the likelihood which exists that a very large proportion of this value will be retained, renders the method of salting in this manner well worthy the attention of our more skilful agriculturists. It would greatly benefit both theory and practice also, were careful series of experiments to be made in different localities, with the view of determining the true relative value in feeding stock of the grass of the same field when newly cut and when salted and preserved in the manner above described.

4°. But this method requires new arrangements, and involves considerable outlay, in the first instance, on the part of the farmer; and he may ask again—Can my present method of making my green crops into hay not be so improved as, if not to retain all the benefits of keeping it in the soft state, at least to preserve more of the nourishing virtues than my hay at present possesses?

I have already alluded to the change of starch, &c., into woody fibre during the drying of the cut grass; *but the more quickly the drying is effected, the less extensive will be the change of this kind which will take place.* Samples of hay made after the English and Scotch methods are *believed*—I am correct, I think, in saying that they are *known*—to differ in nutritive value. In the dales of Yorkshire, cattle can be fattened upon hay alone, which is said to be rarely the case to the north of the Tweed.

* "*Verhandlung des Baltischen Vereins für Förderung des Landwirthschaft.*" Greifswald, 1842, p. 38.

The main difference between the two methods consists in the greater attention given to the frequent turning of the hay in the south, and the consequent greater rapidity with which it is dried. More of the substance of the hay retains, therefore, its soluble or digestible state; and though any two samples of such hay may differ from each other in feeding qualities—as the grasses from which they are formed may also differ—yet there can be little doubt that an equal quantity of grass, converted quickly into hay, will yield more nourishment than if won slowly after the Scottish manner. In the number of the Transactions for March last, (1843,)* Mr Little and Mr Miller have described the methods adopted by them for the more expeditious saving of meadow hay, which are worthy the imitation of every really economical farmer. It requires only a series of carefully-conducted experiments upon the relative feeding properties of two quantities of hay made from the same field of grass, by the longer and the shorter methods, to shew, in a clear and intelligible light, the waste which is caused by the former, and to ensure the more general and more rapid adoption of the latter, method.

5°. Another point, in considering of the causes of the supposed loss of nutritive value by the conversion of grass into hay, will suggest itself to the practical man. The more of the natural juice or moisture he can safely leave in his hay, the less will it suffer of that portion of the loss which arises from the *drying*, and thus rendering less quickly digestible the nutritive matter which the grass contains. The method recommended by Mr Little, of stowing the hay into *hay barns*, renders unnecessary either the excessive drying of the Scotch method, or the less prolonged drying of such English hay as is intended to be preserved in stacks in the usual manner. It may be a matter of doubt whether, *ultimately*, any more water will remain in the less dried hay thus stowed away in barns; it is, however, a fair, and it would be an interesting, subject of trial to the enlightened feeder, whether the same quick-won hay acted in a very different manner upon cattle—either in retaining them in condition, in adding to their weight, or in increasing the quantity or quality of their milk, when built up into stacks in the usual way—than when carried in a more moist state into barns erected for the purpose.

6°. I shall only advert to one other point. Hay, in whatever way it may be made, is known to undergo a certain amount of fermentation in the stack. This fermentation, even when it does not proceed too far, causes a loss of about ten per cent. in the weight of properly won hay, but generally imparts to it an agreeable odour, and causes it to be more readily eaten by cattle.

* Prize Essays of the Highland and Agricultural Society of Scotland—xiv. p. 750.

Before the middle of the ensuing summer, the hay loses about ten per cent. more, after which, though kept through a second year, its weight remains nearly stationary. What effect have these losses on the original nutritive value of a given weight of the new made hay? By some it has been thought that the alleged difference between the nutritive powers of grass and of hay made from it has been caused, in part, at least, by the loss it undergoes during fermentation or otherwise, after it is built up into a stack. This is by no means improbable; but to what extent this cause really operates in lessening the value of hay, we can only guess; we have no satisfactory experiments on record by an appeal to which even an approach to the truth can, as yet, be made. Yet it is only by having recourse to experiment that the materials can be obtained by which the truth upon this, as upon all other agricultural subjects, can ultimately be elicited.

In the present paper, five series of experiments are suggested.

1°. What weight per day of green food, newly cut, is necessary to keep a full-grown animal in a given condition?

2°. What weight of the same green crop, cut in the same state, is necessary when preserved moist, and salted after the German method above described?

3°. What weight of the same grass when made into hay after the quick or English method?

4°. What weight when won after the protracted Scotch method?

5°. What relative weight when in the state of newly made hay in August—of winter hay in January—and of old hay in the ensuing summer?

I hope there are some of the members of the Highland and Agricultural Society of Scotland who have the opportunity and the leisure, as well as the inclination, to undertake such experiments. Performed in the stable or in the cow-house, they will be far more valuable than if attempted in the laboratory of the chemist. The chemist may analyze a portion of grass in each of the states we have mentioned; but, at best, he can only form a theory from his results in regard to its relative nourishing powers in each state. The experiment of the feeder, on the other hand, will not only ascertain the natural fact, but will test, also, the chemical theory, while the frequent repetition of his experiments will afford a sure basis on which more mature theories may hereafter be established.

In the hope that some may be induced to enter upon this interesting though hitherto almost untrodden field, as one of *accurate* research, I shall draw the attention of agriculturists, on a future occasion, to some of those points which ought to be particularly attended to in experiments upon the feeding of stock.

REPORT OF EXPERIMENTS MADE WITH CERTAIN SUBSTANCES AS MANURE, COMPARED WITH KNOWN FERTILIZERS.

By Mr T. Bishop, Land Steward, Methven Castle, Perthshire.

It will be admitted by every one conversant with the culture of field crops, that, even although the prerequisites of draining, trenching, and subsoiling, have been effected in the best possible manner, there is still something wanting, (particularly on inferior soils,) to render them productive. Exposure to the air, and comminution of its parts, can only be serviceable on a soil already containing much vegetable matter, with a due proportion of inorganic salts. The distance at which waste lands are generally situated from towns or populous villages, almost precludes the possibility of being benefited by their surplus manure. The cultivator's only resource is to burn the inert vegetable sward —a practice often injurious on particular subsoils—or to apply caustic-lime brought from a distance, which, with bad roads, and the limited capital of the generality of occupiers, has greatly retarded the progress of cultivation. Happily, now, as much bone-dust, rape-cake, nitre, nitrate of soda, and other extraneous salts and substances, can be conveyed by one loaded cart, as would equal from fifteen to thirty cart-loads of other fertilizers, such as were formerly used before these were brought into repute, which are now established by the assiduous labours of agricultural chemists as appropriate manures either to supply the deficiencies of nutritive matter, or to suit the variations and combinations of soil under particular circumstances. But, notwithstanding these recent aids to superior cultivation, it would be highly improper for the careful agriculturist to neglect other substances more within his reach, which may be made available for the production of crops, and which are often allowed to go to waste, whilst a little expense, laid out on labour only, would add considerably to his disposable manure. With a view to draw attention to some of these, I take the liberty to detail a few experiments made with different substances last season (1842) in the cultivation of potatoes, which may perhaps induce others interested in agricultural affairs to make farther trial of their efficacy.

Having prepared for planting with potatoes a piece of ground rather of inferior quality, (it being formerly part of an old road,) three drills were opened on the best side of it, on the 12th of May, at the usual distance apart, containing, in the whole, about nine falls of land, to which was applied three and one-sixth cubic yards of village dung, purchased at 3s. per yard, being a compound

of pig's dung, ashes, and urine. To the next three of equal length and breadth was given two and one-fourth yards of fermented grass-seed refuse, (named Martin's mixture.) The next three got three single cart-loads of grass weedings, chiefly roots and leaves of the *Holcus lanatus*. The next three were manured with one-half cwt. of guano, at 18s. per cwt. The next two with one cwt. cocoa-nut-dust. To the succeeding three, forty bushels of carbonized sawdust were applied. To another three, three yards of cow droppings, collected from a pasture field in winter, were given. And to one single drill a load of wasted straw.

The crop was lifted on the 17th of October, and the produce from each separate manure carefully weighed on the spot. The following tabular view will best illustrate the results :—

No.	Substances used.	Drills.	Falls.	Quantity used.	Expense	Produce of space.			Produce per Scotch acre. 5 cwt. p. boll.		
						cwt.	qrs.	lbs.	bolls.	fir.	pks.
1	Village dung, - - -	3	9	3⅙ yards @ 3s., - -	9/6	12	3	7	45	3	1½
2	Martin's mixture,* -	3	9	2¼ ―― no charge,		17	2	13	62	3	2½
3	Grass weedings,† - -	3	9	3 loads, Do.,		9	3	8	32	5	1¾
4	Guano, - - - - - -	3	9	½ cwt. @ 18s., - -	9/	10	1	1	36	3	0
5	Cocoanut-dust, - -	2	6	1 cwt. @ 6s., - -	6/	8	0	20	43	3	2½
6	Carbonized sawdust,‡	3	9	40 bushels lime used,	2/6	10	0	14	36	0	0
7	Exhausted cow droppings,§ - - - -	3	9	3 yards, no charge,		8	1	16	28	4	3¼
8	Wet wasted straw,§ -	1	3	1 load, Do.		1	2	5	16	2	3¼

* No. 2.—From repeated trials, I have found this compound a more powerful manure for potatoes than dung, rape-cake, or bone-dust. And although it is not to be obtained in large quantities, it well deserves the attention of agriculturists in more respects than one; for, besides being a first-rate manure, its use prevents the pernicious seeds, separated in dressing grain or grass seed crops, from being carried back again to the arable land in a state to vegetate afresh, and feed on the manure intended for the production of other crops; to avoid which we have often seen bushels of this refuse flung down on the lanes or entrance to farm steadings, for the wild birds to carry away, or trampled into some hole or mire from whence they may be returned in a few years; whereas, were they placed into a covered shed, and a sprinkling of water put regularly over them, they would soon attain a very high state of fermentation, and, considering that the greater part of these seeds are from cruciferous and composite plants, which chemists have found to contain much phosphate of lime and carbonaceous matter, this fact may very well account for the very fertilizing effects of this manure.

† No. 3.—Although the produce from the grass weedings, as indicated in the table, does not shew any great return, still it is a well-known fact, and verified in the writer's experience, that a very heavy crop of potatoes can be raised the first season by only digging down the sward of land in a state of ordinary fertility, and I know of no means by which a farmer can increase his manure at an easier rate than by *sputtling* up the grass sward by road-sides, ditch-bottoms, and hedge-banks, during the summer months, and carting it into lengthened heaps, mixing it up with about one-fourth part of stable-dung, to hasten its fermentation, covering it over with road scrapings, ashes, or bog earth, and afterwards turning the whole mass over, and mixing it well, about a month or six weeks before it is applied to the land.

As the beneficial effects of nutritive manures are so fully demonstrated by ample returns of produce, it is a matter of importance to ascertain how far these can be increased with safety, so as to ensure a due remuneration, and to excite others in the attempt. I shall close this communication with a short account of an experiment made last season in growing potatoes.

On the 5th of May, 1842, I applied fifty gallons of ammoniacal water to forty falls of land, which were immediately harrowed in; the drills were opened on one half of the space, forty-two inches apart, and on the other half thirty inches, and both were abundantly supplied with well-fermented dung; the potato sets were thereon planted fifteen inches separate in the wide-formed drills, and from eight to ten inches in the narrower, and the earth returned over them with the plough, and, in a week thereafter, was smoothed down by passing a bush-harrow along them; both parcels grew freely, and when those in the wide drills were eight or nine inches high, I gave four of them a dressing of nitrate of soda, about half an ounce weight around the stems of each plant, and the same quantity of guano to other two drills adjoining them,

With the aid of such composts, I have been enabled to raise fair crops of potatoes on thin muir land, after draining and subsoiling; and a neighbouring farmer last season had better crops of both turnips and potatoes from adopting this practice than he had after using his best farm-yard dung. Perhaps were such composts to remain a greater length of time before using them, they might approximate the quality of nitre beds—a slight addition of soot or salt would doubtless increase their fertilizing effects. The extension of this system would confer beauty as well as benefit to all the cultivated districts of the country, by preventing the accumulation of unsightly matter, and that host of pernicious weeds so frequently seen on the margin of arable fields, and which are a reproach to good husbandry.

‡ No. 6.—Having deposited two specimens of this substance in the Society's Museum, on the 2d of August, 1842, I trust to be excused from going into a detail of the process used, as my experiments are still in progress for converting sawdust into charcoal with less waste in ashes; and having made only a few trials of its efficacy as a manure, including this on the culture of potatoes, for which it appears to rank nearly equal to guano. But confiding on the accuracy of statements given to the world by Liebig, Professor Johnston, and others, of the great capabilities of charcoal of attracting and condensing ammonia within its pores, I do not despair of seeing it used as an absorbent in extracting the effluvia from stables and byres, and badly ventilated wynds and closes in towns and cities, to be carried to the fields and assimulated with the soil in the production of crops—as all that springs from the earth, and is nourished thereby, has to return at some future period in the shape of food. The means by which a substance so perfectly useless to vegetation (as sawdust is in a fresh state) can be accelerated in decomposition, so as to become a serviceable manure, at little expense, is worthy of consideration and farther experiment; the usual practice to get rid of its encumbrance at many sawmills is to put it down the stream which drives the machinery, in which it is apt to form obstructions, and it certainly operates as an annoyance to fish.

§ Nos. 7 and 8.—The produce from these two substances is just such as science would have inferred, and shews that bulk is a bad criterion as to the value of manure —the first having in a great measure lost its nutritive salts by exposure to the atmosphere and washing rains, and the last possessing none of the qualities acquired by fermentation.

the ground was kept clear of weeds by the hand-hoe, and no farther earthing was given them. The effect of the last dressing shewed very early, and never was there seen potato-stems of strength and size equal to them in this country—ultimately covering the whole width of the drills. On the 17th of October, the produce contained within a square chain was lifted and accurately weighed, and the same was done with those planted in the usual way, which had received no extra dressing, when it was found that those growing on the wide drills, and dressed with the nitrate of soda and guano, exceeded the others at the rate of seventeen bolls per Scotch acre. The four drills dressed with nitrate of soda, shewed greater luxuriance throughout the season than the two dressed with guano; but, in an experiment made to grow large turnips, the guano was found more efficacious.

REPORT OF COMPARATIVE TRIALS WITH GUANO AS A MANURE FOR TURNIPS.

By Mr John Dudgeon, Spylaw, Kelso.

The grand desideratum in agriculture has long been to obtain, in a concentrated form, a stimulant to the growth of plants. The first advance to this desired end—and it was a most important and rapid one—was in the application of ground bones to the soil; by which, besides the saving in the price of the material compared with other manures, an immense advantage was obtained in the facility, and, above all, economy in carriage and distribution. A farther movement has now, it would appear, been effected in this direction, to a still greater extent, by the use of guano; which, in the amount or weight required, is, it may be safely said, as to bones, as one to four; and thus has been nearly realized something equivalent to that boast of science, which has been often quoted by practical men only to be spurned, "that the day would come, when a person should carry in his pocket manure sufficient for an acre of land;" for certainly there is a near approach to a fulfilment of this proud achievement, when we find an ordinary cart-load of manure is discovered to be amply sufficient for a field of ten acres! At least the result of the following experiments with guano will be found to warrant such a conclusion; and it is confidently believed that the more general application of this manure, in the present season, will exhibit such effects as cannot fail to impart greater confidence as to the expected results of the labours of the laboratory, and hence will be removed one of the chief obstacles to the successful

and more immediate efforts of chemistry in the cause of agriculture.

The powerful effects of guano, as compared with its price, as well as the economy of time and labour in its application—from the small quantity necessary—promise, in the present depressed state of agricultural produce, to come in good stead to the farmer; and I shall be glad—in the confident hope that they will experience similar results to what, in a small scale, I have obtained—if this report be in any way instrumental in leading my brother farmers to a fair and somewhat free trial of this new manure. Though the experiments to be stated were limited in their extent, it is considered they were in every case quite sufficient to afford a complete test of the relative merits of the manures used; and I may mention, that so satisfied have I had every reason to be with their nature, as affording a just estimate of the power of guano, that I have made arrangements to have, this season, (1843,) upwards of sixty acres of turnips prepared with this manure alone.

These experiments, or comparative trials, were made upon three several fields, intended to be manured in different ways. The quality of the land, too, was well adapted for such a trial, as being in each, and indeed partly in the same field, somewhat various, though incumbent generally upon a bed of similar geological formation. But I shall best be able to state clearly the distinctive characteristics of the different fields as I proceed to notice the nature and result of each experiment separately.

Experiment No. 1.—This field, lying upon a slope with a southern exposure, is, for the greater part, a good loam, rather, perhaps, sandy, and resting upon a retentive subsoil of firmly condensed sand mixed with reddish clay; but the upper part of the field, for about a fourth of its length, gradually becomes shallower in soil, and, as it approaches the top of the rising ground, is a muir, or thin peaty soil, incumbent upon a hard muirband pan, more indurated as the soil becomes thinner. The quality and depth of the loam again improves, as the part of the field described terminates at the open ditch or burn by which it is intersected. To give a farther idea of the difference of the soil, the value of the land may, in the lower part of the field, as compared with the upper, be estimated as three to one. The field has been partly, but hitherto very imperfectly drained, the operation of furrow-draining, generally, upon the farm having only been commenced this season.

The whole of the field, properly prepared by previous ploughing, &c., after a wheat stubble, was made up, in the ordinary manner, into twenty-seven-inch drills; and, excepting those drills

reserved for the guano, were dunged in the usual way, immediately before sowing, with well-prepared farm-yard manure, at the rate of about eighteen square yards to the acre; the upper and poorer part of the soil being rather favoured in the application. Two drills, formed in the usual way and of the ordinary depth, were selected at random, to which guano was applied, distributed by the hand, and without any mixture, at the rate of three pecks per acre. The ordinary dung followed in the next three drills, applied in precisely the same quantity and manner as on the rest of the field. The next two drills, from top to bottom of the field as before, in as exact proportions as the operation could be performed, were again done with guano in quantity equivalent to four cwt. per acre. Then again came three drills with the farm-yard dung, and two succeeded with guano, at the rate of fully more than five cwt. per acre.

The whole was sown on the 31st of May immediately following the application of the manure, as the drills were closed in with the plough. The species of turnip was *Dales Hybrid*. The crop came equally away over the whole field, and met with no check, nor did there appear much marked difference in the drills done with the guano previous to singling, or thinning out the plants with the hoe. Very soon, however, after the turnips began to stand up after this operation, the *guanoed* drills came to manifest a superiority, and by the time the plants were ready for being horse-hoed, they were very decidedly and visibly superior in vigour of growth, particularly on those drills to which the *greatest* quantity, namely, five cwt., was given. This superiority in appearance continued to increase as the growth of the turnips advanced; and the tops stood up conspicuously higher in all the six drills done with the guano, but certainly in proportion to the quantity applied, and shewing to rather greatest advantage upon the inferior part of the land. So matters continued during the summer, and many to whom I had an opportunity of shewing the progress of the growth of the plants, required not to have pointed out to them the particular limits of the experiment. But when, from the prevalence of the long drought of last season, turnips generally came to suffer in the leaf, and it was feared that mildew had seriously affected the plant, it required a closer inspection to discover the continued, and—on the drills manured with the smallest quantity of guano,—apparently more doubtful, excellence of that part of the crop to which the guano had been applied. This, however, was satisfactorily tested, when, in the middle of October, (the 14th,) the whole six drills were carted off, topped and rooted, and weighed; each two, as differing in the quantity of guano applied, compared with two drills immediately adjoining,

on which the farm-yard manure had been used. The result was as follows :—

		Cwt.	Sts.
Two drills with	*guano*, 5 cwt.	25	5
Two ...	dung, 18 yds.	18	7
Two ...	*guano*, 4 cwt.	22	6
Two ...	dung, 18 yds.	19	7
Two ...	*guano*, 3 cwt.	20	6
Two ...	dung, 18 yds.	19	2

The general character of the crop was a fair average, and having been consumed in greater part on the ground by sheep, was estimated to have produced £6 : 10s. an acre, assuming the keep of a Leicester dinmont to be worth 6d. per week.

Experiment No. 2.—The part of the field upon which this experiment was made, is of a much drier texture, and, from this circumstance, may be held as more purely a turnip soil than that occupied by No. 1, though, from the peculiarity of last season, it may be here noticed that neither was at any time wet while under crop. Where the guano was here used, the soil is in some places very near the rock, forming a sort of whinstone gravel, somewhat peaty in its consistency. The trial was in this instance made against bone-dust and coal-ashes. The ashes were sifted and intimately mixed with the bones, some days before being applied, in the proportion of half to the bones by measure; and, it might be, these ashes were made up in part of other substances, as they were obtained from the neighbouring town. The quantity altogether used was twenty-four bushels per acre; thus, sixteen of bones and eight of ashes. The quantity of guano applied was at the rate of three cwt. per acre upon four drills—two and two together, at an interval of eight drills manured with bones and ashes as above stated. Then, at a similar interval, followed two drills, operated upon at the like rate with guano, namely, three cwt., together with sulphate of soda, (glauber salts,) at the rate of four cwt. per acre, being the only instance, in the course of these experiments, in which any additional foreign substance was used with the guano. The field was prepared in the usual way as the other, after an oat stubble, and the whole manure was applied, and turnips sown, consisting of *Dales Hybrid* and Skirving's purple-topped yellow, in alternate drills, on the 8th of June. The drills manured with guano exhibited their situation from the greater freshness of the leaf of the plant, from its first appearance above ground, and they were earlier ready for the hoe. As the season advanced, these drills continued to maintain their superiority, as in the other field, until the whole was somewhat checked by the prevailing drought, though this crop, being later sown, was less affected generally from this cause. No dif-

ference, however, was at any time noticed on those drills to which the sulphate of soda was applied in addition, compared with the other guanoed drills. The turnips were drawn about the latter end of November, and on a comparison of the weight of the crop on two of the four drills done with guano alone, (the quantity on the other two having been prevented from being ascertained by a mistake in the taking up,) with the produce of the average of four drills, nearly immediately adjacent, manured with bone-dust and ashes, the results stood thus—the plants having been topped and rooted—

	Cwt.	Sts.
Guano, ...	23	2
Bone-dust, &c., . .	19	2

The weight of the crop to which guano and sulphate of soda together were applied, was 23 cwt., being less than that produced by the use of guano *alone*, though, certainly, in so slight a degree as to forbid the conclusion that the sulphate of soda had done any injury.

The crop, generally, on this field was rather of a superior description, and may be estimated, in the manner of the former, as likely to have yielded at least £7 per acre.

Experiment No. 3.—The guano was here tried against bone-dust alone, applied at the rate usual in this district, of sixteen bushels per acre, the guano being at the rate of two cwt. only. The soil of this field is a good loam with fully more clay in its composition than the better parts of No. 1. The subsoil also is rather more tenacious, and though, no doubt, capable of being worked, in ordinary seasons, into a fine tilth for turnips, and, in such circumstances, growing this root well, it may be described as, in its present inadequately drained state, decidedly too wet to admit of the crop being very accessible or profitably available, excepting in early autumn or late in spring. The past season has thus been peculiarly favourable for such land, and the crop upon the whole field consequently fine, and hence also it is that the turnips are yet being eat off and the test of this experiment newly made. Two drills were, by chance, as in the other fields, set apart for the guano about the middle of the field, the whole being prepared in the ordinary manner as above described. The guano was applied by the hand in the drill, before being finally made up, as were the bones, which is the usual way here, machines for this purpose being little in use in this district, as being thought neither so efficient nor economical. The seed immediately followed, and the whole was sown on the 23d of June, with the white stone globe variety of turnip. Here the drills manured with guano shewed very early a superiority, and the plants, though not separately operated upon, were fitted for the hoe fully eight days earlier than the remainder of the field. This

advantage of more vigorous growth they continued to maintain throughout the whole season; and this field having at no period exhibited any bad effects from the prevailing drought in autumn, the whole continued vigorous in leaf—yet this general luxuriance did not prevent a decided superiority from being recognised in the rows where the guano had been used, until, indeed, influenced by frost. The crop was weighed, roots and tops being in this instance taken, on the 22d March, when the result was found to stand thus:—

	Cwt.	Sts.
Two drills guano, ...	31	4
Two ... bone-dust, . . .	24	7

The difference here being greater than seemed warranted by the appearance of the crop, it is conjectured that the turnips on the *guanoed* drills may have suffered less from the effects of frost, from which all seemed, at this late season, to have been partially injured, though no visible difference in quality could be said to have been observed.

It has been considered quite unnecessary, in noticing these comparative trials, to give any estimate of the acreable value of the crop relatively to the expense of the manure applied, as it is conceived every practical farmer will be best able, from the data above furnished—under the particular circumstances in which he is placed, both as affecting the value of the crop and the other manures used—to make this calculation for himself. The relative value from a given extent is at once seen; and, it is sufficient to mention that, excepting when applied (as in one instance in No. 1) in an unusually large quantity, the value of the guano was considerably under the expense of the other manures. Guano can be bought at present, of the best quality, it is understood, from 10s. 6d. to 12s. per cwt.—a price which, in the quantity it has been here established as sufficient, and considering, above all, the great facility of application, comes far under the value of any manure hitherto applied successfully to the soil.

Postscript.—Since the above paper was read at the Museum Meeting of the Highland and Agricultural Society, the subject to which it relates may be said to have lost much of its novelty and primary interest, many having this season obtained for themselves ocular demonstration of the transcendant effects of guano in the growth of turnips. A number of these trials—and, perhaps, beyond the limits of his own district—the reporter has reason to believe were undertaken in consequence of the abstract of the report given in the newspapers at the time of the Museum Meeting, at which it was read, took place; and he may now mention that, acting upon that thorough confidence in the result of his experiments which he felt warranted him in so strongly recommending guano to the attention of his fellow agriculturists, he has this season grown upwards of 70 acres of turnips with this manure—applied in the drill by the hand, at the rate, generally, of 3 cwt. per acre, without any other mixture—and he presumes he may safely challenge Scotland to exhibit a better crop, of the same extent, upon similar land, produced by any other means.

SPYLAW, *5th September*, 1843.

ACCOUNT OF AN EXPERIMENT IN DEEP PLOUGHING.

By the Rev. JOHN JAFFRAY, Dunbar, East Lothian.

[*Premium, Five Sovereigns.*]

THE experiment was made upon a small field, which is sixty-five feet above the level of the sea. The soil is sandy, resting upon a subsoil of sand and gravel of great depth, and so thoroughly drained by the declivity of the surrounding lands, that want of moisture is its natural defect. There is but little difference between the soil and the stratum on which it rests beyond what culture and manure have made; but, from sinking of gravel, treading of horses, and pressure of the plough, year after year, and age after age, the subsoil had become crusted, hard, and beaten as a road. In short, from shallow ploughing, there was but little depth of cultivated earth, and, as on all such soils in dry seasons, the crop was scorched and scanty.

With a view to render this field fruitful in any season, it was subsoiled with the Deanston plough, eighteen inches deep, and sown with wheat for crop 1837. The great vigour and luxuriance of the crop attracted general notice; and it must have yielded an extraordinary increase, if it had not been lodged by wind and rain shortly after the ear appeared. Therefore it gave only thirty-eight bushels of grain per acre, but three tons of straw, which proved its great strength. To this crop one of potatoes and two of wheat succeeded; but it is the culture of this field for crop 1841, and the result, which chiefly constitute this report.

It was all equally dressed with seaware; and four acres of the same quality and description were measured and staked off. Two of these acres were ploughed twelve inches deep with two horses, and two of them eighteen inches deep, with four horses. These two portions in all other respects were cultivated and managed exactly alike. They were planted with potatoes of the Don species in the last week of April, eight inches deep, twelve inches asunder, and in drills thirty inches wide, running at right angles to the furrows of the experimental ploughing. The potatoes were planted deeper than usual, therefore the shoots were longer in coming through the ground, but when they did appear, it was with great strength and regularity. They expanded their broad deep-green leaves, and grew vigorously, in the dry sandy soil, in a very severe and long-continued drought. It was soon evident that the deepest ploughed portion had the advantage; the stems and branches of its plants were stronger, and they first covered the ground.

The potatoes were lifted in the last week of October, when it was found that the land ploughed twelve inches deep produced

fifty-seven bolls per acre, and the land ploughed eighteen inches deep produced sixty-nine bolls per acre, being a difference of twelve bolls per imperial acre, of four cwt. to the boll.

It is a condition annexed to the premium offered by the Highland and Agricultural Society for experiments in deep ploughing, that one-half of the land used "shall be cultivated in the ordinary way." By evidence before the Agricultural Committee in 1836, the depth of ploughing in this county is from *six* to *nine* inches. If that depth had been taken for the lowest extreme in this experiment, the difference in the production of the two portions, it is believed, would have been greater; but as this field had been ploughed *twelve* inches deep for years, its ordinary depth was adhered to, and the difference is certainly sufficient to establish the advantage of deep ploughing.

As to the quality, it is excellent for the season from both portions of the land, and in that respect there is no difference. The potatoes from the deep tillage were larger, more of one size, had fewer small ones, and not so many of a green colour as those from the other division.

The quantity on the deep tillage is eighty-seven bolls per Scots acre, which is a good crop for any year; and it will readily be granted that it is far above the average of the district this year, many fields not producing half a crop. A superiority so striking must, therefore, be ascribed to deep culture, being on both portions deeper than ordinary, which furnished moisture in a very dry and scorching season to a sandy soil, and raised its produce above that of richer lands. But though this is a great crop for the season, it must have been still greater if the field had been less exposed, as it has no shelter; and three days of very violent wind in the first week of August broke down the plants, which, from their great luxuriance, were then very tender, and checked their growth.

The practical conclusions to be drawn from this experiment are—

First, That deep ploughing increases the produce.

Next, That, as both portions of the land used in the experiment were opened up eighteen inches deep by the subsoil plough for crop 1837, the full benefit of that operation is not obtained till the earth so loosened is again ploughed up. And the reason is evident; for it is then only that the soil is deepened, by an addition from the subsoil with which it is intermixed, and rendered more fruitful.

Lastly, If deep ploughing increases the produce, it increases also the supply of vegetable manure; and a greater portion of manure, added to improved culture, must produce a progressive increase of fertility and of produce.

This experiment was begun on the glebe of Dunbar for the

amusement of the reporter, and before he knew that any premium upon the subject was offered by the Highland and Agricultural Society.

ON THE RADICAL EXCRETION OF PLANTS.

By Alfred Gyde, Esq., Painswick, Gloucestershire.

[Premium, Fifteen Sovereigns.]

The radical excretion of plants is a subject on which much diversity of opinion exists, even among men of high scientific reputation, and it is highly important that a thorough knowledge of this subject should be arrived at, more especially as regards the influence which this excretion exercises on a succession or rotation of crops.

If the opinions of Messrs Macaire and De Candolle be correct, viz., that plants excrete from their roots matter which has an injurious effect on plants of the same species, while it is capable of supplying food to plants of a different kind, it would be highly desirable to ascertain means, if possible, of changing the qualities of this matter, that it may be rendered available as food for plants of the same kind, and that thus the necessity of a rotation of crops may be avoided. But if plants do not excrete matters injurious to the healthy vegetation of their own species, the question for consideration is, what properties do plants remove from the soil which render it unfit for the cultivation of the same crops successively.

The investigations and remarks which I am now about to offer for consideration, relate to the first of these inquiries; and, I presume, it will be seen from direct experiments that, although plants do, to a certain extent, excrete from their roots, still the matter thrown off does not act injuriously on the vegetation of the same species of plants, but, on the contrary, it rather improves their health and vigour.

The principal objects kept in view in proceeding with the experiments about to be detailed were the following:—

1. Accuracy in the mode of conducting the experiments, that nothing likely to throw light on the subject might escape notice.
2. The examination of the excretions, in order to ascertain of what they consisted.
3. To ascertain if any difference existed between the excretions and the ordinary juices of the plant.
4. The nature of the effects produced by these excretions on the vegetation of plants of the same species as those which had excreted them; also on some other species.

The plants used were those of ordinary farm culture, viz., wheat, barley, oats, pease, beans, vetches, kidney-beans, potatoes, and cabbages, and these were used generally in two or three different stages of their growth.

My reply to the questions—Do plants really excrete? if so, What do they excrete? will be given in a series of experiments on the plants themselves; previous to commencing with which, considerable difficulty was experienced in deciding on the best mode of performing them. It was considered necessary that the plants should, to the fullest extent possible, have an opportunity of performing their several functions, and, at the same time, that there must be no insurmountable difficulty in obtaining the product thrown off by their roots. By way of preliminary experiment, a few plants were removed from a garden soil, but, in doing this, the minute fibres could not possibly be preserved from injury. But plants grown in pots filled with earth,* and plunged in the soil, were easily removed without injury to their roots; and, by placing the plant under a running stream, the soil was readily washed away, and the fibres left uninjured. This being accomplished, the roots of the plants were placed in glass jars filled with water—the purity of which had been ascertained by reagents—and the jars were placed in cases which excluded the light, the plants occupying a situation as favourable for their healthy vegetation as possible.

In most instances the plants were used in three distinct stages of their growth—when young, when in bloom, and when ripening their seed. It was soon found that, by conducting the experiments in the way described, a solution was obtained, which was impregnated with the odour of the plant; and, on the application of reagents, this solution was found to contain gum or mu-

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* Analysis of the soil in which the plants were grown:—

Gravel and coarse sand, principally carbonate of lime, -	654
Fine sand, - - - - - - - - -	95
Carbonate of lime, - - - - - - -	73
Soluble humus, - - - - - - - -	20
Insoluble humus, - - - - - - - -	78
Phosphoric acid, combined with lime and magnesia, -	2.50
Sulphuric acid, combined with lime, - - - -	1.50
Saline matter, principally potash, - - - -	1.25
Chlorine, - - - - - - - - -	trace
Magnesia, Carbonate, - - - - - - - -	.25
Silex, (very fine,) - - - - - - -	40
Alumina, - - - - - - - - -	30
Oxide of iron, - - - - - - - -	3
	998.50
Loss of water, - - - - -	1.50
	1000.00

cilage, extract and traces of earthy and alkaline salts; also, that the water which had, in some cases, acquired the peculiar odour of the plant, on being submitted to distillation in a retort, was found to contain a volatile matter. Most of the experiments were conducted in the following manner:—After the plants had been left in water for two days, as already described, a portion of the water was removed, placed in test tubes, and the following reagents were applied, viz., nitrate of silver, producing a cloud with organic matter, which, in a short time, became of a reddish-brown colour. Subacetate of lead, giving a floculent precipitate of gummate of lead. Perchloride of mercury, iodine, and ferrocyanate of potash were also used, but no particular result was produced. Oxalate of ammonia generally gave a precipitate of oxalate of lime. On evaporation, a light-coloured residue presented itself, sometimes brown, and precipitating a portion of extract during evaporation, as in the bean; at other times straw-coloured, soluble in water, converted into a carbonaceous mass on being heated, when it evolved a smell resembling roasted grain; and, when rubbed between the fingers, it had the appearance of bad Indian ink. On the addition of hydrochloric acid to the mass, a solution of lime was obtained; the lime being detected by oxalate of ammonia. The water was examined every second day, and the tests and the appearance of the plants were carefully noted. The following is the order in which excretion was obtained:—

1. Plants in bloom yielded most.
2. Plants young yielded less than the former.
3. Plants when maturing their seed yielded little or none.

Such plants as the bean, kidney-bean, and pea, having roots of a spongy texture, gave much more than those whose fibres were more woody, such as the barley and wheat; the bean and the cabbage imparted to the water the strongest odour, whilst the water from the wheat and barley was inodorous. But to ascertain how far there was anything in these excretions differing from the ordinary juices of the plant, I submitted a portion of the fibres of the roots to the following examination:—The fibres, after being well washed, were placed in a marble mortar, with a portion of distilled water, and well bruised; the mass was then thrown on a filter, and the clear solution afforded the following results:—It yielded the peculiar odour of the plant, darkened the solution of nitrate of silver, gave a floculent precipitate with subacetate of lead, and, on evaporation, the residue had all the properties of the matter obtained by the evaporation of the water in which the same kind of plant had been placed. I also cut plants of the same kind, placed the cut ends in water, and, after two days, I found the water, on being tested, and also on evaporation, to

afford results corresponding with those of my former experiments on the same class of plants. The following plants were grown in pure silex, and supplied with water only :—Beans, wheat, and vetches; these all grew extremely weak, and the roots were found to be very numerous. Having placed them in water, on examination the bean was found to yield results similar to those grown in the garden soil, but the vetch and wheat gave only a trace of organic matter.

Plants were also placed in water, and every two days were removed, washed, and placed in fresh water. The water was then examined, and in every instance less residue was left on the evaporation of each following portion. Different plants gave very different quantities of excretion, but the following will apply to most of them.

Gramineæ.—Of this order, wheat, barley, and oats only were examined; they retained their freshness for some time in water, but did not grow. On examining the water, it was found to be devoid of smell, taste, and colour, yet it gave indications of organic matter, and traces of lime. On evaporation, a very slight residue of straw-coloured matter was left, which was again soluble in water.

Leguminosæ.—The plants of this order used were bean, pea, kidney-bean, and vetch, which, with the exception of the kidney-bean, all lived well in water, which was impregnated with the odour of the several plants. The plants of this order were found to yield excretion in a larger quantity than those of any other order experimented on, the bean and pea giving a portion of extract. The amount of excretion is in the order in which they appear above; the vetch giving least of the leguminous plants.

Cruciferæ.—These were the cabbage and mustard. The cabbage vegetated but imperfectly in water; it soon, however, imparted its peculiar smell to it, but no particular taste was perceived. On examination, it gave traces of gum, and a volatile matter capable of separation; the residue left on evaporation was nearly devoid of colour, and very trifling.

Solanaciæ.—The potato was the only plant of this order used. The excretion from this plant was very trifling, having no smell or taste, and yielding but slight traces of organic matter or earthy salts.

Another series of experiments was performed, to ascertain whether plants had the power of refusing any noxious matter; and, if not, how far they had the power of excreting it again by their roots?

In this series, plants were placed for twenty-four hours in weak solutions of the following salts, viz. :—Sulphate of magnesia,

ferrocyanate of potash, sulphate of soda, muriate of soda, and potash. On removing the plants, their roots were well washed and placed in water; and this water was examined every day, for the purpose of detecting the different salts, but in no instance did I obtain more than a trace, although the plants had removed a considerable portion, which I was enabled to detect in the substance of the plant.

A potato plant was also removed from the soil, the fibres cleaned and divided, the upper portion being wrapped in bibulous paper to prevent fluid passing by capillary attraction. Two glasses were also placed one within the other, the inner filled with a weak solution of ferrocyanate of potash, the outer with a solution of iron, and the plant placed with part of its roots in each solution. This plant retained its healthy appearance nearly a week, and a considerable portion of each solution was absorbed, but not the slightest colour made its appearance in either glass. So that there could have been no excretion of the absorbed solution, although, on examination, the characteristic blue pervaded most of the plant—Prussian blue—obtained by mixing in solution nitrate of iron with ferrocyanate of potash. A few experiments were tried, to ascertain the effect produced on plants by water holding excretion in solution.

Eight beans in bloom were placed in water for three days, and eight growing beans were marked in the middle of a row in the garden, to each of which two ounces of the water from the beans were applied every alternate day, with two ounces of common rain water to each of the others. At the expiration of fourteen days, a clever Scotch gardener, residing in the neighbourhood, decided in favour of the plants watered with excretion, the foliage being larger and of a darker green than the rest of the row. Similar experiments were tried with wheat, cabbage, and kidney-beans, and with similar results.* Beans were also placed fresh from the earth in water holding excretion in solution, and others in pure water, by their side—both vegetated alike, and lived equally long. Beans and pease were watered with a cold infusion of the stems and leaves of similar plants bruised in water, observing the same precautions as in the last experiments, and the results were the same. Silex (first boiled in hydrochloric acid) was placed in a porcelain basin, and sown with mustard seed, placed under a frame, and supplied with water. It vegetated well until the rough leaf began to form—the plants then became yellow and drooped. They were then removed and the sand divided, one half was well washed, and on both portions fresh seed was sown. In each case vegetation ap-

* These plants maintained their vigour during the whole of their growth.

peared equally active, until the plants required supply from the soil, when, in both cases, they drooped and died. Mustard seed was planted on flannel and supplied with water; when the plants ceased to grow, they were torn off, and more seed was sown, the old roots remaining in the texture of the flannel; this was repeated four times, but without impairing the vigour of the succeeding vegetation in the slighest degree.

From these experiments we deduce the following facts:—

1. That most plants impart to water certain soluble substances or excrētions.
2. That this is identical with the sap of the plant.
3. That plants have no power of selection, but take into their texture any solution offered to their roots, and that they have little or no power of again excreting it.
4. That plants watered with éxcretion receive no injury from it.

I much regret that the season had too far advanced to allow me to perform a series of experiments to ascertain the effect of excretion on crops generally; but as far as they have been tried, it certainly does not injure their growth.

In order to save the trouble of writing the experiments in detail from my note-book, which would have rendered this paper very bulky, I have arranged them in a tabular form, shewing at once the general results of the experiments.

Table I. is intended to give the names of the plants, the state of their growth when used, the tests by which any alterations were produced in the solution, together with some general observations.

Table II. indicates the results of the experiments made on plants grown in silex.

Table III. is intended to shew the results of experiments made on plants, their roots being first placed in saline and metallic solutions for twenty-four hours, then removed, washed, and placed in water.

Table IV. is intended to shew the effect of excretion when applied to the roots of plants.

Other experiments were tried, and other tests used, which are not detailed in the tables, the general rósults being already stated.

TABLE I.—*Shewing the Results of the Experiments on Plants grown in Soil and afterwards placed in Water.*

Name of Plant.	State of growth.	Nitrate of Silver.	Sub-acetate of Lead.	Oxalate of Ammonia	Time plant retains its healthy appearance.	Colour of residue on evaporation of water.	Observations.
Beans	8 inches high	pale red after a few minutes	white	cloud of oxalate of lime	14 days	light brown	During evaporation, a portion becomes dark and insoluble in water, but soluble in sol-potash, alcohol has no action on it. The water acquires a smell of the plant which may be separated by distillation. Plants in bloom do not set their seed, and the matter rendered insoluble by heat diminishes as the root becomes woody.
Beans	in bloom	red-brown	white	ditto	6 days	brown	
Beans	seed nearly perfect	red colour	trace of gum	trace	14 days	light brown	
Beans	bloom	brown	white	cloud of lime	6 days	brown	
Pease	8 inches high	rose tint	white	ditto	12 days	yellow	On evaporating water holding excretion of pease in solution, it was found much paler in colour than from the bean, giving less insoluble matter, and the smell of the plant was very trifling; hot alcohol had no effect on it, but it was soluble in water.
Pease	in bloom	dark brown	white	trace	6 days	yellow approaching brown	
Pease	seed nearly perfect	brown	white	trace	10 days	yellow	
Vetches	young	slight red	slight	—	6 days	trace of yellow matter	The excretion from the vetch is less than from the bean or pea; it imparts little or no smell to the water, and is in other respects similar to the pea.
Vetches	bloom	ditto	trace	—	8 days	ditto	
Kidney-Beans	young	slight red	trace	trace	8 days	pale brown	Excretion from kidney-beans is trifling; it imparts a slight smell of the plant to water with only traces of gum, &c.
Kidney-Beans	in bloom	ditto	white	ditto	3 days	ditto	
Wheat	young	slight red	white	—	10 days	pale straw-colour	The excretion from wheat is very trifling, it has no smell or taste, is of a pale straw-colour, and has all the appearances of gum or mucilage.
Wheat	seed	ditto	ditto	—	12 days	ditto	
Wheat	bloom	—	trace	—	10 days	trace	
Oats	young	pale red	trace	—	10 days	straw-colour	The excretion from the oat is very trifling, and the observations correspond with those of wheat.
Oats	in bloom	very pale red	trace	—	8 days	pale straw-colour	
Barley	6 inches high	—	trace	—	15 days	slight residue and straw-colour	The plants live well in water, but excretion is exceedingly trifling, and resembles excretion from wheat and oats.
Barley	bloom	—	trace	—	10 days	ditto	
Cabbage	half grown	slight red	trace	—	4 days	very slight and pale yellow	The cabbage imparts a strong smell to water, capable of being separated by heat. The residue is devoid of smell and taste.
Potato	when the tubers are beginning to force	—	trace	—	6 days	trace	The potato excretes but a trace of gum.

TABLE II.—*Shewing the Results of Experiments on Plants grown in Silex and placed in Water.*

Name of Plant.	State of Growth.	Nitrate of Silver.	Sub-acetate of Lead.	Oxalate of Ammonia	Time plant retains its healthy appearance.	Colour of residue on evaporation of water.	Observations.
Beans	8 inches high	brown	white	—	12 days	slight and brown	The excretion in this experiment resembles in all respects the excretion from young plants grown in the garden soil.
Vetches	10 inches high	—	trace	—	10 days	trace yellow	The vetch gives but a trace.
Wheat	6 inches high	—	trace	—	10 days	trace yellow	Wheat imparts a trace only to water.

In no instance did the excretion from one plant, when dry, amount to a grain in weight.

TABLE III.—*Shewing the Results of Experiments on Plants placed in Saline Solutions.*

Name of Plant.	State of Growth.	Solution placed in, and time.	Tests.	Observations.
Potato Cabbage Pease	half-grown	sulphate of soda for 24 hours	nitrate of byrates superacetate of lead	The plants retained their healthy appearance for several days, the cabbage being the first to droop. The tests indicated the slighest trace of sulphuric acid, which, I am inclined to believe, was washed out.
Potato Cabbage Bean Pea	half grown	carbonate of potash for 24 hours	after concentration of water tincture of litmus	The tincture of litmus did not indicate any alkali.
Potato Cabbage Pea	half-grown	ferrocyanate of potash for 24 hours	nitrate of iron acetate of copper	These tests gave me the slightest possible trace.
Beans	half-grown	muriate of iron for 24 hours	ferrocyanate of potash	A very slight trace of blue, when the light fell obliquely on the test-tube.
Oats	in bloom	chloride of sodium for 24 hours	nitrate of silver	No indication of chlorine.

The solutions contained two drachms of the respective salts to a pint of water. The plants remained twenty-four hours in each solution; when removed, they were well washed, and then placed in rain water.

TABLE IV.—*Shewing the Effects of Excretions when applied to the Roots of Plants.*

Plants Watered with Excretions.	State of Growth.	Excretion from	Observations.
Kidney Beans	before bloom	kidney beans	Six plants were marked in a row of beans, and two ounces of water, holding excretion in solution, were added every alternate day, the other plants having the same quantity of rain water. The watering occupied a week; and, at the expiration of another week, the plants watered with excretion were darker in foliage, and had the advantage in growth.
Kidney Beans	before bloom	watered with sap of kidney beans in solution	The mode of conducting the experiments, and the results, were similar to the first in this table.
Beans . . .	six inches high	beans	The mode of conducting this experiment was similar to the first. Result in favour of beans watered with excretions.
Wheat . . .	growing	wheat	No apparent effect.
Cauliflower .	growing	cabbage	Plants more healthy in appearance than the rest of the row.
Cauliflower .	growing	beans	No apparent effect.
Beans . . .	growing	plants in water in which beans had excreted	These plants were compared with others in pure water; they lived equally well; and, if any difference in appearance, the plants in excretion had the advantage.
Mustard . .	seed sown on flannel, under a hand-glass, and placed on a plate		In this experiment water was used to moisten the flannel. When the plants had obtained the rough leaf, they ceased to grow. They were then torn off, leaving the roots in the flannel, which was again sown with seed. In each crop (the sowing was repeated four times) no diminution of vigour was observed.

ON THE ACTION AND USES OF LIME IN AGRICULTURE, AND THE MOST EFFICIENT AND ECONOMICAL MODES OF APPLYING IT TO THE SOIL.

By James Anderson, Esq., of Gorthleck, Inverness-shire.

[Premium, Ten Sovereigns.]

The action of lime in agriculture depends much on the state in which it is applied to soils, whether pure as an oxide of calcium, or combined with an acid, and then, chemically speaking, a salt of lime, and likewise on the condition and composition of the soil in various respects at the time of its application.

The lime of agriculture is principally derived from large deposits of native carbonate, and, in this form, it is found in frequent and very considerable quantity among the various geological formations. The sulphate of lime is also found in very considerable quantity in Germany, including Austria, France, Switzerland, Spain, the American States, the Peninsula of Nova Scotia, and New Brunswick, in our own country, and elsewhere, abundantly. However, the sulphate is not in Britain yet applied directly to the soil so extensively as in America and other countries; it exists in vegetable ashes, and is sometimes so applied in this country, particularly to the leguminous crops, as the clovers, with very beneficial effects. In Holland, the utmost confidence is placed, and with apparent good reason, in the restorative and fertilizing powers of the ashes of bituminous peat.

Phosphate of lime, another salt or acid compound of this substance, is applied in bone manure, being the principal mineral integrant in their composition; and it is also supplied to the soil by the application and decomposition of the vegetable fibres and animal substances which find their way into the fructifying mass of the farm-yard manure heap. It occurs in nature in veins and beds in connection with tin and iron ores, and is found in masses in Britain—in Devonshire and Cornwall—and in, at least, one locality in Spain, besides in Saxony and Bohemia, and elsewhere. This substance would be well worth a fair trial in various soils, and we have every reason to think, from experiments on a small scale, it might prove a valuable manure.

The principal supply of lime, however, for agricultural purposes is derived from the application of strong heat to the native carbonate, which expels the carbonic acid, and in this state it is carried to the surface over which it is to be applied, where it is slaked with water, with which it readily combines, being at the same time reduced to a fine powder, the most convenient form for its application to the soil.

When pure, before uniting with water, carbonic or other acid, it is known under the familiar appellation of quicklime. Applied in this state to soils containing organic substances, it enters into union with these substances and forms compounds which are partially soluble in water. All organic substances contain abundantly carbonaceous matter and oxygen, and, by attracting these, the quicklime is gradually converted into a carbonate. But in practice the quicklime is generally slaked with water before it is applied to the soil, in order to reduce it to a powder; and it is thus more equally divided in the process of scattering it over the surface. When slaked, or in union with water, it is chemically styled a hydrate, and operates in the same way as quicklime in reducing or combining with organic substances. It retains no longer the same action; but, on the contrary, operates powerfully in preventing the too rapid decomposition of organic substances already in a state of solution or approaching to it.

Having stated generally, in a few words, the action of quicklime and hydrate, and carbonate or mild lime, we shall reserve the details of the most efficient and economical modes of application to be specified and explained as they may naturally suggest themselves in our progress.

1. We have to consider the most suitable period in the rotation for the application of lime.

With a view to economy and efficiency both, this must be when the land is preparing for a fallow or fallow crops. It should always in this case be applied as a hydrate. At this time an opportunity is offered, when the land is in progress of tillage at any rate, of intermixing and thoroughly incorporating the lime with the soil, when it immediately acts, as before stated, upon any insoluble organic substances which it may contain; and, instead of remaining dormant, inactive, and useless, as these substances had been during the previous rotation, they gradually form combinations with the lime, which become partially soluble in water, and thus, when lime is judiciously applied to a fallow, it is one reason for a smaller quantity of manure sufficing. This, of course, will only happen when there has been an accumulation of fibrous and insoluble organic matter in the soil, which is always the case in newly improved land, and where the soil, though in cultivation, has never previously undergone liming, and more particularly if it contains in itself little native calcareous matter.

With regard to the crops to which lime is found most beneficial, we shall begin with the *Cerealia*, and of these we shall speak to wheat, barley, and oats. We know, in innumerable instances, that wheat is grown on soils previously incapable of

yielding an abundant or remunerating crop. We do not doubt that this is partly owing to the previous operation of efficient draining, as the most ignorant agriculturalist is now aware of the fact, that the application of manures, organic or inorganic, is comparatively fruitless without attention to draining, as a preparative, in the first instance.

From the previous application of lime to a fallow, we see a very moderate allowance of manure—consisting either of bones, themselves containing a large proportion of phosphate of lime—and various combinations of decaying organic substances, produce an admirable crop of turnip, and thus prepare the way for a rich and luxuriant crop of barley, and this, too, on soils that ranged formerly very low indeed in the scale of fertility, but have been quickened into life and productiveness by the presence of this new agent. We have seen also a very superior crop of barley frequently produced on barren moorland, by the simple application of lime, and with a very little addition indeed of innutritious and ill-prepared manure in our own island, at an elevation of 800 or 900 feet, and between latitude 57° and 58°, and this too on a soil, to say the most for it, of average barrenness.

As to the oat crop, in the rotation, we have not observed that it is by any means proportionally so much improved by the application of lime. But this may be accounted for by the great exhaustion of manure caused by the luxuriance of previous barley crops. In high and cold localities, where oats are cultivated as the principal grain crop for winter fodder, and the lime applied and harrowed in above the ploughed natural lea, the effect on the crop has been very beneficially apparent, particularly and chiefly where the land had been well drained before the application of the lime. The improvement in the succeeding pasture-grass was, if possible, still more remarkable and lasting. This is easily accounted for when we consider that the cold in this country, at considerable heights, and the consequent low natural temperature of the contained water in the soil, together tend to retard the decomposition of any portion of the fibre of the growing natural herbage that may be left unconsumed on the surface. But when lime is applied, it immediately dissolves this fibrous deposit, which has been, from the above causes, unceasingly accumulating, and converts it into wholesome and abundant nourishment for a higher and more useful class of plants. At great heights, then, and in cold localities generally, the effects of lime are particularly striking, and also very lasting, after draining.

Of the *Leguminous* crops, we may say unhesitatingly, from what we have observed, that they cannot be cultivated with any success without the previous application of lime, unless where abundance of native calcareous matter exists in the soil. The

bean, indeed, and, so far as we have observed, the potato crop, are exceptions to this rule; although we have seen lime, in compost with earth or old turf dykes, give a most productive and valuable crop of potatoes.

Whether spread on the surface of pasture-land alone, or in compost with earth, or applied with a crop and grass seeds, with a view to pasture, it never fails to call into existence the dormant seeds of the superior grasses in the soil, and to nourish and facilitate the growth of those that may have been confided to it by the agriculturist. This is a fact placed beyond all dispute. It is a never-failing fertilizer of grass land.

2. The effects of lime on peaty soils are the following:—

Peat is known to contain two substances inimical to vegetation, and eminently preventive of the changes and interchanges, the decompositions and recompositions, necessary to afford a supply of genial nourishment to a superior class of vegetables. These injurious substances are tannin and gallic acid. But let us consider for a moment the composition of these inimical compounds, and we shall find that we have it in our power, by a simple process, to convert them into substances most friendly to the advancement of superior vegetation, and in this form contributing highly to the fertility of soils. We find on analysis that they are composed of the following constituent proportions:—

	Carbon.	Hydrogen.	Oxygen.
Tannin, .	52.59	3.825	43.583
Gallic acid,	56.64	5.00	38.36

We have shewn, in the first part of this essay, that quicklime and hydrate have a powerful affinity for carbonaceous matter and oxygen. This known, with the assistance of the above analysis, it is at once clear how they operate beneficially on peaty soils. It is evident that, by appropriating a portion of the carbon and oxygen, the lime neutralizes the acid in both these substances, itself becoming a carbonate; and, by this change, substances that were formerly destructive to fertility, combining in part with the lime, are resolved into their simple elements, and, assuming a new character, gradually become capable of sustaining an improved vegetation. Of course, as we have already shewn, the lime will act on the fibrous vegetable remains in the soil, combine with them, and convert them by degrees into soluble and fructifying nutriment for vegetables. If, after peaty lands have been once limed, it should be found advisable, for any cause, to break up a lea, (and this should be as seldom as possible, such lands being better laid to grass,) it would be an improvement to do so by paring and burning, as, by the application of heat, a

portion of the lime, now converted into carbonate, from being so long buried and in close contact with the soil, would be freed from its acquired acid, and restored anew to its original state of purity when first applied—or, in other words, be reconverted into quicklime—and would thus be rendered capable of exerting a renewed action on the peaty substances present, and, from its recovered causticity, again promote the various processes of decomposition and recomposition so favourable to the development of healthful and luxuriant vegetation.

3. The action of lime on clayey or aluminous soils is as follows :—
It operates both in the fertilization and comminution of clayey soils. From the minuteness of its particles, they easily insinuate themselves into the clay. On the particles of lime, too, encountering any enclosed organic matter in these aluminous masses, a strong action immediately takes places between the lime and such matter, which, by combining with, disorganizing, and reducing such organic matter, destroys the continuous solidity of the clay which contained it; and from this, with the evolution of the gasses and other attendant action, the stubborn clay at length becomes cellular.

4. In sandy soils, lime operates beneficially as follows :—
It is well known that sand (silica) differs much from clay (alumina) and lime, in two important characteristics particularly. Both lime and alumina have a great affinity for organic matter and moisture, and retain both these substances by a powerful attraction; sand has no such affinity, and on this depends its barrenness. It is merely commingled with organic matter at any time, never chemically combining with it in any quantity, and retaining it by no degree of attraction whatever. In this way it offers no resistance to the rapid escape of such substances by combinations with the components of moisture deposited by the atmosphere and the constituents of the atmosphere itself; and the fructifying properties of the manures are thus quickly withdrawn from the soil, and escape from it, in the aerial form, into the atmosphere. Besides this, they are washed away, in part, by heavy rains and superabundant moisture, beyond the reach of the root fibres of the crop they were intended to nourish. To cure these defects, lime is applied. From its affinity for moisture, it attracts it from the atmosphere, and, when voluntarily discharged from this source, promotes its retention in the body of the soil. By combining with any organic manures that may be added to the soil, it prevents their wasteful and too rapid escape; and thus, by rendering the soil more retentive of moisture and organic substances, and improving its tex-

ture and consistence, eminently promotes and increases its fertility.

After the explanation we have just given, it is difficult to see how lime can be dispensed with in the improvement and perfecting of any soil, unless that soil should be naturally calcareous. Such a soil effervesces powerfully with acids, and is thus easily detected by the most untutored inquirer. The only case in which we found lime to produce no great sensible or perceptible beneficial effect, or very little, was when superabundant moisture existed. But, even where the soil had been previously exhausted by overcropping and bad cleaning, we have found quicklime, by destroying insects and their larvæ, and the seeds and roots of noxious and unprofitable plants, and by converting these, as already explained, into wholesome nutriment for succeeding crops, a most useful coadjutor, in connection with a well-conducted fallow, in restoring vigour and energy to the most exhausted subject. Where former injudicious applications of lime had been made, we can recommend no efficient restorative but a copious supply of organic manure and rest in grass.

One instance of abuse of lime we may particularly notice here. Thirty years ago and upwards, lime, at the rate of 200 bushels of hot shells an acre, was spread on between 100 and 200 acres of very light, siliceous, open, dry, gravelly soil, scarcely 200 feet above the level of the sea, and within a mile of the coast, between lat. 57° and 58°, in north Britain, and being treated rather sparingly on some occasions, in after cropping, as to manure, till within the last eight years, though correctly farmed by the rotation of turnip, barley, and hay seeds, and hay followed by pasture for one year, and sometimes two years, it has not and will not recover this overdose for a long time to come.

Although the soil was poor, the lime, being new to it, exhausted at first all its organic matter, and produced wonderful crops for some years; but at length it came to be, that, in 1839, rather an unfavourable season, and frequently previously in a field of upwards of twenty-five imperial acres, there was not produced twenty quarters of oats, and the quality not so good as the dressings of a very rich and productive crop. It will be a very expensive and unremunerating process to recover this soil by rest and manure. Some parts were, at the same rate and at the same time, manured with lime containing a trace of magnesia, and these portions of the surface are still quite distinguishable from the remainder by a vegetation of an aspect if possible more miserable, sickly, and attenuated than that which covers the general surface.

5. We now come to consider the effects of lime on a deleteri-

ous subsoil. On this subject we can also venture to say a little, from some experience and attentive observation in the improvement of waste land, and from extensive draining of arable and waste in the progress of improvement.

Subsoils frequently hold in their composition deleterious substances, which consist principally of the salts of iron or manganese, and some acid, resembling the gallic and acetic, derived from the decay of vegetable substances. We have witnessed the benefit in these instances of the application of quicklime. In the first place, the lime attracts and combines with the acids, by which means the salts of iron and manganese are neutralized, and the acid adhering to the lime is not merely rendered innocuous, but converted into a positively fertilizing substance. Where any sourness, or vegetable acid in any form, exists in the soil or subsoil, which very frequently happens on examining the composition of waste lands with a view to improvement, and which has been caused by the long existence and periodical decay, while in its unreclaimed state, of a worthless vegetation, if lime be applied, it immediately combines with and neutralizes the effects of such deleterious components, destroying the acid by withdrawing its carbonaceous matter and oxygen, and thus, becoming a carbonate of lime, materially adds to its own value as a fertilizing ingredient. This we have tested frequently, so as to satisfy ourselves of the efficiency of an application of lime in all such cases, and of the perfect propriety of recommending it to an improver whose chemical knowledge may not be sufficient to conduct the simple process of analysis, if he should have any good ground for suspicion from the dark colour of the subsoil, or any other familiar and often locally understood symptom, that such latent causes as we have been describing are operating against his interest.

The salts of the protoxide of iron amount to thirty-eight, with nine double salts, making together forty-seven salts of the protoxide of iron; and these are generally soluble in water. The known salts of the peroxide of iron amount to forty-three, with twelve double salts, making fifty-five salts of the peroxide of iron, and they are *all* soluble in the same menstruum. Most of the salts of manganese are soluble in water, and on their precise degree of solubility depends their destructive and injurious effects. The salts of iron, where water abounds in the soil, gradually form, by combining with the earths, as we have often seen, a most impervious and injurious subsoil; but on being freed, by draining, of excess of moisture, and broken up, and, more effectually still, if trench-ploughed after draining, and thus partially exposed to the fructifying and pulverizing action of the atmosphere, such a subsoil will be speedily rendered innocuous; and, if lime be thereafter applied, the cure is complete;—and, after

resting a little, a soil thus prepared may be converted to the purposes of profitable culture.

6. We have already, under head 2, shewn the effects of the application of lime in improving the texture, constitution, and general fertility of the soil. We may now add here, that when calcareous matter is deficient in soils, it will be highly beneficial to supply it even in the state of native carbonate, and without calcination, if a supply can thus be more cheaply and conveniently obtained from the sweepings of the highways, which often contain a considerable admixture of carbonate, or from any other native calcareous deposit, such as shell or clay marl, or calcareous sand, &c. Clay marl is best adapted to sandy or siliceous soils, and shell marl and calcareous sand to clayey or aluminous soils or stiff loams. However, when too easily obtained, such advantages are sometimes abused; several instances of this kind have come under our observation, and we may here mention one as an example. On an estate in North Britain, where a very valuable and extensive marl deposit exists, permission was given to the tenantry to apply this substance to their farms free of all charge: their holdings chiefly consisted of light siliceous and very shallow peaty soils, and the proportions were left to their own discretion. This deposit was very rich in calcareous matter. It was used with something like suspicion and distrust at first in any great quantity, but some favourable results so raised the expectations of the tenantry that they heaped on their land an unlimited bulk, and the consequence was, that a few years of fruitfulness and of injudicious, and too often incessant, cropping were succeeded by yearly increasing sterility and loud and fruitless lamentations. The soil, of course, will require the same treatment to recover it as if it had received an over-dose of unmixed lime.

7. The quantity of lime which might be applied to the soil in different cases is a most important subject; also, whether it seems most beneficial to apply lime in large quantity and at long intervals, or in smaller quantity and at shorter intervals; and we shall endeavour to be as explicit and intelligible on the subject as we possibly can.

In a deep peaty soil there is little danger that the proper quantity of quicklime will be exceeded, and carbonate may be applied in almost any probable quantity. We need only instance as grass-ground the famous Orcheston meadows. In a sandy soil there is scarcely more danger that this will be the case with carbonate, neither will it be so with caustic lime, provided it be well mixed beforehand with clay or common soil containing a proportion of organic matter, such as old turf dykes or pond scourings, or suchlike substances. When a soil contains a fourth part of

alumina, (a stiff wheat soil,) and lime is to be applied for the first time, it should never be in less quantity, at the very least, than 150 bushels of shells, heaped measure, to the acre. A third part of this quantity should be repeated on occasion of every *third* fallow thereafter, to keep up a desirable activity in the soil, a great proportion of the first applied quantity having by this time disappeared and been washed away by natural agencies; and on each occasion of a fallow, when no lime is applied, from one cwt. to two cwt. of nitrate of soda or potash to the acre should be carefully sown over the young wheat or turnip crop, as it may happen, a moist morning being selected for the purpose; and this will not only nourish and stimulate the young plants, and effectually destroy the numerous tribe of insects and their larvæ, so peculiarly destructive to the turnip crop in its first stages, but what is not appropriated of it by the plants descends with the moisture into the soil, and immediately acts upon the lime, now chiefly become a carbonate, by depriving it of its acid, and restoring it to its original state of purity, when its caustic properties are restored, and it again operates with the same activity as when first applied to the soil. It is necessary to apply the 150 bushels in the first instance to insure the effectual solution of the natural and necessary accumulation of the insoluble organic matter which must occur in a soil which has been covered with vegetation of any description; but a small application every third fallow, with the alkaline application to each of the two intermediate fallows, will thereafter prevent any such useless accumulation of insoluble organic matter, which needs must otherwise increase in the soil from the annual decay of the root fibres and other accidental and necessary remains of the different natural herbage, plants, and crops of the previous rotation.

When a soil is composed of four parts in five of silica, the remainder being principally alumina and organic matter associated with a portion of impalpable siliceous powder, it may be made a superior turnip soil, and incalculably improved by the application of carbonate of lime in large quantity; but about 100 heaped bushels of shells to the acre will be a sufficient dressing of caustic lime on a first application to the soil, care being taken that a fair allowance of manure is always supplied at each recurrence of a fallow, and it may be repeated in the same proportion and at the same periods (a third to every third fallow thereafter) as we have just recommended in clayey soils. The quantity of nitrate of potash or soda, be it observed, to be the same in both cases, that is, the same both in aluminous and siliceous soils, but the proportion of lime to vary as 100 to 150, both in the first and successive applications. We have every reason to think, from all our patient investigation, experiment, and experience that

this will eventually be found a very economical and effectual if not the most economical and effectual, method of applying lime to soils.

When easily and cheaply obtained, about fifteen bushels of wood or peat ashes, applied in the same manner, form a good substitute for the nitrate of soda or potash ; and bituminous peat for this purpose is always to be preferred.

8. We have already stated that we have universally found that, unless thoroughly underdrained, it is in vain to expect any remunerative return from the application of lime, and we may add, any description of manure, whether organic or inorganic. Where superfluous moisture exists, the interstices of the soil are completely choked up with the fluid, the beneficial action of the atmospheric air excluded, a sourness contracted prejudicial to healthy vegetation, and the fructifying portions of the manure rendered inactive or washed away beyond the reach of a crop, while the temperature of the soil is also materially reduced by the presence of superfluous moisture.

9. The effect of applying lime along with other manures, that is, at the same season, and to the same crops with other substances, depends entirely on the period of the operation of fallowing at which it is applied.

If it be applied to the fallow before the dung, and harrowed sufficiently into the soil, intermixed and incorporated thoroughly with it, the lime will combine with and immediately operate in reducing all the root fibre and insoluble organic remains of the natural herbage or previous crops as it may happen to meet with, and thus convert into nutriment, for the succeeding crop, what was before of no service whatever ; and if any acid or noxious rejected matter should be left by the plants of the previous rotation, as is believed by many scientific persons to be the case, the acid and noxious principles are neutralized by the lime, and the soil purified and enriched at same time. If not laid on, however, till after the dung is applied, of course it must and does abstract carbonaceous matter and oxygen from the manure, in the first place, combining with the more soluble portions, and this combination rendering them temporarily in great part less soluble, and thus not so well calculated to afford immediate nutriment to the succeeding crop. This may not be of such importance in wheat culture, which crop is best treated as a biennial, and thus remains a long time on the ground. But it does not appear to be so well calculated for a turnip crop, requiring as it does an immediate and concentrated supply of stimulating and soluble nourishment. With farm-yard dung it does and must operate in this way.

We have used street manure to turnips, which suits this crop better than most others. Street manure frequently contains a considerable portion of carbonate of lime, and sometimes native sulphate; but an application of caustic-lime, after adding this manure to the soil, operates precisely as in the former case we have been describing, in forming compounds partially insoluble in water, and in withdrawing carbonaceous matter and oxygen, and thus being ultimately converted into a carbonate.

Rape-cake we have used very little, although, thrown into the soil along with the seed of turnip, in moist seasons, it makes a capital dressing, as we have often witnessed. It is well suited to clay soils in some cases; but is scarcely adapted to a fallow, unless combined with more substantial and lasting manures.

We have used bones extensively in different soils, but always as limed land, and have never paid particular attention to the effects of applying both at the same season. We know, however, from very careful analysis, that the following is their composition:—

Cartilage—a compound of Carbon, Oxygen, Hydrogen, and Nitrogen.	Soda.	Carb. of Lime.	Phos. of Lime.	Fluate of Calcium.	Phos. of Magnesia.
33.3	1.2	11.3	51.4	2	1.16

Of course the application of caustic-lime would operate powerfully in reducing the bone, by acting on the cartilaginous portions, and withdrawing the carbon and oxygen; but we have always found the most efficient and economical method of applying this manure to be over a portion of spit dung previously deposited in the turnip drills, which is preferable even to mixing the bones with the manure to cause fermentation before applying the mass. The evolution of gasses and volatile alkali, with the increase of temperature during the fermentation caused by the subterposition in the drill of the spit dung, affords the most forcing and stimulating nourishment to the tender germ, and has the further recommendation of economy and efficiency. We have grown a very excellent crop of turnip on a very dry light siliceous gravelly soil, with eight bushels of bones, over ten single horse-cart loads of farm-yard dung, an acre.

With regard to *soot*, we have witnessed its admirable effects sown over grass lands, spring corn, tares, and young turnip, but have never seen it applied at the sametime with lime. It is most effectual in destroying the numerous insects which prey on vegetables in their early stages. However, we should think it injudicious in the extreme to apply it with quicklime, which would immediately and wastefully decompose its substance by disengaging a great portion of the volatile alkali, although there would not be the same objection to sulphate of lime, which would rather operate in preventing the too rapid disengagement and dissipation of its volatile parts.

We may conclude this head by remarking that where the object is permanent pasture, the application of the manure and the lime *at the same time* has been found beneficial, the effects being more lasting; but quicklime or hydrate should never be applied to rich fertile old loams in cultivation, containing much soluble organic matter, unless as a compound with vegetable mould, or in some shape intimately combined with organic substances.

10. It seems superfluous here to describe the familiar operation of fallowing. All that one need say is, that after this cleaning operation has been carefully executed on the best principles, the lime should be well harrowed in and thoroughly incorporated with the soil. From being reduced to a hydrate it becomes so perfectly divided, and its particles rendered so minute, that the chemical action on any organic remains of former crops it meets with in the soil is immediate, and thus, rapidly becoming mild from this action, it is, in a manner, prevented from combining with the more soluble portions of the subsequently applied organic manures. Care must always be taken not to exhaust the soil by overcropping after the application of lime in any shape, and the most approved and least exhausting course or rotation adopted on similar soils should never be departed from; and a farmer should never yield to the lure of a deceitful fertility consequent on a first application of lime; for the stimulus which produced this fertility will speedily exhaust the vigour of the soil, unless its energy is supported by judicious management.

11. It is very advantageous in some cases to apply the lime in the form of a compost, with clay, earth, or sand. A sort of artificial marl is thus formed, which is advantageously spread on grass lands, affording them additional nourishment, at the same time that the quicklime or hydrate is partially deprived of its caustic property, which recommends the practice much—caustic-lime in powder being, in quantity, destructive to living vegetables. When the object is to improve the texture of a soil of sand, or clay, or peat, a compost has much to recommend it. Lime combined with sand being best adapted to an aluminous or peaty, and with clay for a siliceous subject. A compost in such cases has been found to be eminently beneficial, and preferable to the application of unmixed lime.

ON THE CULTURE AND KEEPING OF POTATOES OVER SEASON.

By Mr James Carmichael, Raploch Farm, Stirling.

[Premium, the Silver Medal.]

Numerous and important as are the recent improvements in the field culture and storing of the various products of the soil, there is one species of crop, and that too of extensive cultivation and very general usefulness, namely, the potato, which, notwithstanding its great value and singular adaptation to every soil and almost to every climate, is nevertheless subjected by the British farmers to one uniform mode of treatment both in the field and storehouse; obviously because they have in this, as in other instances, contentedly adopted the practice of their predecessors, without inquiring whether their practice were consonant to the natural habits of this the most common and prolific of all esculent roots. For it is impossible to conceive a greater violation of the laws of nature and of reason than is annually and inveterately committed by the present system of cultivating field potatoes. Of this fact there cannot exist a doubt in the mind of any one who will take the trouble of carefully watching the growth of the root fibres, as well as the development of the stem and leaves of the potato plant. Let the earth be very gently removed from the stem on its first appearance above ground, or whilst the bud from the set is only bursting into leaves, and it will, even at this earily period, be found that the lateral fibres, sent out from the stem in search of food which the parent set can no longer support, although the set may still, and long after, seem quite fresh and vigorous, and, doubtless, does still in some degree nourish the young plant. Yet it is perfectly evident to the observer that these fibres progress much more rapidly than the stem throughout the after stages of the plant towards maturity; and before the plant has attained the height of two or three inches above the surface, the fibres will have spread themselves ten or twelve inches in all directions *under the surface* of the ground.

Now, if this be the natural habit of the potato plant, can anything be more at variance with it and by implication to the interest of the cultivator himself, than the undeviating practice of repeatedly applying the hand-hoe and the horse-hoe, or *scarifier*, to the potato drills, from the brairding of the plant to the time of the final *setting up* by the plough, and thus destroying those numerous tender and essential fibres almost as soon as formed? Is it possible to hoe so deep and pare so close to the potato-stems, and thus destroying those fibres, with-

out materially retarding the growth and checking the productive powers of the plant, and, consequently, lessening the crop of potatoes?

How much the actual loss thus annually sustained over the whole kingdom may be, it is impossible to determine—nor is it necessary to make the calculation, for that the practice must be highly injurious is plain; inasmuch as it not only destroys many of the food-gathering fibres of the young plant when most wanted, but also some of those destined to become new potatoes, which are often found near the surface. This may be made apparent by examining potato stems at the close of the season when the crop is taken up—the root will then be found to consist of a perfect mat or net-work of fibres; and were practical farmers to take a glance at the side of their potato drills while the plough is passing along, stirring up the earth, or *taking it away* from the potatoes, they would find innumerable fibres, like so many small threads, all broken off by these operations, which are professedly done to keep down weeds or to pulverize the soil. The potato land, on the other hand, ought to be previously well prepared by ploughing, rolling, harrowing, and hand-weeding, where necessary, before the manure is laid in or the potatoes planted. Were all this properly attended to, very little after hoeing would be required, since the annual weeds could easily be pulled by the hand as often as they appeared around the stems, without injury to the potato roots, and the earth put up by the handhoe or plough as soon as the height of the plants admit of it.

But one great error is, that the drills are too often formed too close to each other, and that very little difference is made between the summer working of the potato crop and of turnips, carrots, or beet; although it is obvious that bulbous-rooted plants ought to be differently treated from those with tuberous roots like the potato. And thus it is, perhaps, that the Irish system of lazy-beds, however objectionable in other respects, yields large crops of excellent potatoes, with very moderate manuring, simply because the plant is there left to luxuriate at will, with little or no hoeing to interrupt vegetation, or otherwise disturb the roots.

The remedy for this improper, unprofitable, unscientific management, is very simple—let the land have a previous thorough preparation, and, when sufficiently friable, and free from weeds, let the drills be formed not less than three feet from centre to centre, the dung well made and carefully covered in, as fast as the potatoes, either whole or in large sets, can be planted, never leaving any dung spread or potatoes uncovered over night, or between yokings in dry weather. And, if the land is very loose, a heavy roller should immediately be made to pass along the

whole drills, to compress the soil and preserve the moisture in the manure. Such a course will go far to prevent the dry rot, and secure an abundant crop of potatoes, provided the hoe be excluded, or very carefully used, in checking the surface weeds, and provided no paring of the drills is attempted. When the plants are so far advanced as to admit of the earth being *set up*, the *scraper* or *scuffler* may precede the plough in strong soils, to loosen the earth between the drills, but should never be allowed to pare off or break the sides of the drills, which ought always to remain rather round than sharp at top; for farmers may rest assured that the less the soil is stirred the better, after potatoes are fully in leaf, so that care be taken to earth them well up at the earliest possible opportunity, or at short intervals, should the drills be so wide as to admit of this process being gone through a second time with impunity. Spring fallows, well executed, are far more efficacious in regard to the green crop itself, as well as to all those that follow, than any after hoeing or summer work can either be to crop or land. And long observation, together with the experience of late years, has fully convinced me that the *dry rot*, *curl*, and other casual diseases or failures in the potato crop, often proceed from bad management—such as allowing the potatoes to heat in the pit, or in the house before or after being cut for seed—making the sets too small—using hot imperfectly made dung, or other impropriety in the planting. Without due attention to all these points, the mere change of seed, however vigorous or well selected, will not of itself always prove sufficient to prevent those diseases to which the potato is liable in the house and field. But where any doubt exists as to the soundness of the seed, it is much safer to plant the potatoes whole, and which does not require so much extra seed as many imagine; because the middle-sized tubers will answer best, and the space between each whole potato may then be made much greater, say nine to twelve inches along the drill.

There is another point to which the attention of agriculturists may be here directed, which is, the propriety of plucking off the potato blossom before the apples are formed. The advantages derived from this operation are already known, but unfortunately as little regarded as the preceding irregularity. Yet the expense is trifling, (1s. to 2s. per acre,) and the operation can be easily performed by women, boys, or girls, in summer evenings, as pastime, whilst the increase of tubers is very considerable, as may be tested by any one trying it for a single season, over the whole or part only of the crop. Indeed it holds to reason in this as in the former case, that by inconsiderately destroying a number of the fibres of the root, and at the same time allowing the root to be further exhausted by the maturing of the stem

blossoms into seeds or apples, it must necessarily tend to diminish the potato crop much below what it otherwise would be. Did farmers carefully study the laws of nature more, and the rules of art less—shun crude theories and abide by facts—they would greatly add to their returns of labour, and also, of course, to the means of subsistence for the whole community.

Much importance is attached to certain modes of storing potatoes in pits of given forms, and covered in a particular manner. Very little reflection, however, is necessary to convince any one that such considerations are comparatively of small moment, so long as this invaluable root is not deteriorated in value, by pitting in almost any form; because locality, convenience, and many other circumstances, must in this, as in other matters, guide the parties as to the site, size, or shape of the pits; and, therefore, those who have large quantities of potatoes, with plenty of straw at hand, can seldom err in following the common form of potato pits, and of putting a good coating of dry straw next the potatoes, with six or eight inches of earth laid firmly and uniformly over the straw; then to finish the pit by a course of thatch all over, and secured with straw ropes, in the same manner as a corn-stack. The thatch is beneficial in preventing frost as well as rain from penetrating to the potatoes; less earth is thus required, and the risk of heating by its over compression entirely avoided. But where the straw is scanty, and the subsoil gravelly, the pits may be partly sunk under the surface, and the potatoes covered with firm thin turf, (divots,) or any other dry substance under and also over the earth on the pit. Potatoes are not only more secure from frost in such pits than in an ordinary out-house, where the door must frequently be opened, perhaps every day, but are also less likely to bud, as often happens where the house is full and too close. Nor are house-kept potatoes so palatable as those fresh from the pit at any period, but especially after Candlemas.

Generally speaking, however, there are few farmers who can allow their potato pits to remain in the fields after Mayday, when the throng of seedtime is at the greatest, and the potatoes are, therefore, hurried away to an over-stocked market, or huddled together in some spare corner, to be out of the way, and for a time forgotten, without any attempt being timeously made to preserve the superabundant crop of one season, to meet the retarded or deficient crop of the following one.

Thus, with few exceptions, potatoes cease to be used or deemed edible in hall or cottage after midsummer, and are, therefore, willingly and wastefully got rid of before that time. Doubtless this waste arises in some measure from the perishable nature of the potato, from its great tendency to germinate as the season

advances, and the temperature of the storehouse or pit increases. Hence every experiment that has been tried to preserve them, and hitherto promulgated, uniformly proceeded on the desire to destroy or check the vegetative principle of the tuber in order to prolong its edible properties—such as baking, roasting, or otherwise expelling the natural sap, or by the application of some chemical preparation. How far all or any of these modes of treatment may be beneficial or deleterious to so essential an article of human food, it is not necessary here to inquire, seeing they are but partially known, and still less frequently practised; for it is manifest to every one conversant with the subject that a remedy requiring much care or complex preparation can never prove acceptable to ordinary farmers, or succeed with the labouring class, to whom the preservation of the potato is of the greatest consequence.

Something at once simple and safe, even if *apparently* less efficacious, must, therefore, be substituted to induce farmers and potato growers to make the trial. Every one is aware that cool apartments, with casual turning, and picking off buds, are not sufficient to preserve the potatoes from becoming soft, shrivelled, and greatly deteriorated in value, at a comparatively early period of the season, particularly when the weather is warm and the apartment well lighted. Under these impressions I began, many years ago, in April or May, to sprinkle the potatoes, and also the floor of the apartment, with water, in which a handful or two of common salt had been dissolved. This solution had the desired effect of restoring the potatoes to their former firm and plump state, as well as of improving their quality. But it ultimately terminated in the total decomposition of the potatoes, which, in a week or so, became a rotten pulpy mass. Proceeding upon these results, I abandoned the salt in the subsequent experiments, using nothing but a slight sprinkling of water, through a common watering pan, every week or ten days, first moistening the floor (an earthen one) and then the potatoes, after being turned over, and carefully picking off the buds, when necessary. This last will be found an easy operation, as the frequent turning and partial watering the potatoes, by cooling the apartment, greatly checks the tendency to germination, which gradually weakens after Lammas; but the state of the weather and appearance of the potatoes will at all times prove the best guide as to the frequency of the operation. The buds should never be allowed to rise above the surface of the potato, and should be carefully removed, on all occasions, with the finger, or a blunt wooden skewer, so as not to wound or break the skin of the potato, or to turn the eye inward, which, on growing, would perforate quite through, and burst out on the opposite side of the potato,

wherever this precaution is neglected. In an out-house, ce llar or barn, when the light cannot be excluded, a temporary screen may be formed by suspending a few pieces of matting or canvas from a rope or pole across the apartment, so as to keep the potatoes in the dark, in a moderately damp state, and free from a close covering. Great care must also be taken not to bruise the potatoes, by throwing them violently about with the hand or shovel in turning, (a very common mode of checking the buds,) than which nothing tends more to the premature decay of the potato; and there is no doubt that potatoes are as often and as seriously injured in this way as apples or fallen fruit of every kind.

In illustration of this fact, it may be stated that, in June, 1841, and again in June, 1842, a quantity of Perthshire red potatoes were bought in the Stirling market, from different parties, for the express purpose of trying how long they would keep; and although they appeared perfectly firm and good at the time, yet, before two or three weeks had elapsed, symptoms of decay began to be evident, from the surface of the potato becoming spotted, precisely similar to the spots seen on fallen apples, and, no doubt, from the same cause, viz., being bruised by falling upon some hard substance, or against each other, and in a short time after, the whole were unfit for use, except a small portion of the heart.

And this may probably be one, if not the main, cause of ship borne potatoes proving inferior in quality, unfit for seed, and more difficult to keep, than those not exposed to rough treatment, though of the same variety, and raised on similar soil. How else can the great difference of price in the London market between the Scotch and English red potatoes be accounted for, where both are chiefly ship borne, but where they have been very differently handled? Hence the variation of 10s. to 20s. per ton in their respective prices.*

Potatoes should not be stored in large heaps during summer, but spread over an earthen, clay, or sand floor, rather than on pavement; the thinner they are laid the better and cooler they will remain. The best or soundest potatoes ought always to be selected for keeping over season; and although the red varieties, from their greater compactness, are generally deemed the most suitable for this purpose, any other variety may, with a little attention, be preserved fit for the table till August or September, that is, until the crop, especially the early varieties, are nearly matured; thus greatly augmenting the annual quantity of human food, without requiring any extra

* After instituting minute inquiry in the London market on this point, it would appear that the chief cause of this discrepancy may fairly be attributed to the greater care bestowed in preparing the English potatoes for the public market.

ground for its culture, simply by preventing the loss consequent on the too early use of unripe or half-formed potatoes, than the use of which nothing can be more inimical to the health of the community. And this objection will be found fully as applicable to the premature use of the early kinds as of the late potatoes.*

The practicability of keeping potatoes over the season has thus been proved over an uninterrupted series of years, not merely by my own experiments, but also by those of many friends and acquaintances in various parts of the country, who, following my directions, have obtained the same result, without one instance of failure.

Specimens of such preserved potatoes were transmitted by me to the Highland and Agricultural Society's office in January, 1840 and 1841, and more recently in August, 1842, when samples of the London Don variety and Perthshire red potatoes, crop 1841, in perfect preservation, were exhibited for me in the Messrs Drummond's stand at the Society's General Show in Edinburgh, and a quantity of the same potatoes were also presented in several dishes, variously dressed, on the table of the Society's Committee Dinner, in the Waterloo Hotel, on that occasion, all of which were kept in an out-house from the preceding April, with no other preparation than turning, picking, and watering, in the manner before described.

It may be proper to add, that the best mode of dressing potatoes thus preserved, is, first to immerse them for two or three hours in cold water, then to pare and place them again in cold water, (salted,) where they may remain a longer or shorter time, according as they may be wanted for a particular meal, when they should be boiled in salted water, and will then be found white, sweet, and mealy.

Nor is this all; for, in watching the progress of these potatoes, I have discovered, and frequently proved, that, however carefully the eyebuds were removed, that did not always destroy the vitality of the potato, for without the assistance of fibres, young potatoes will form, in singles, or in groups of two to nearly a dozen, in the very centre of the old potatoes, like so many eggs in a cup, several of them two to three inches in circumference. The first of these young potatoes were noticed bursting the sides of (some, not all) of the old ones about the beginning of November; and while some were removed, others were allowed to remain, with a view of testing the singularity of producing new potatoes upon a barn floor, without the aid

* There is a variety of red potato, cultivated in the North of Ireland, which I have tried to grow for several years; they are very prolific, and well adapted for summer use, or keeping over season, but unpalatable during the winter months, or when first taken from the ground.

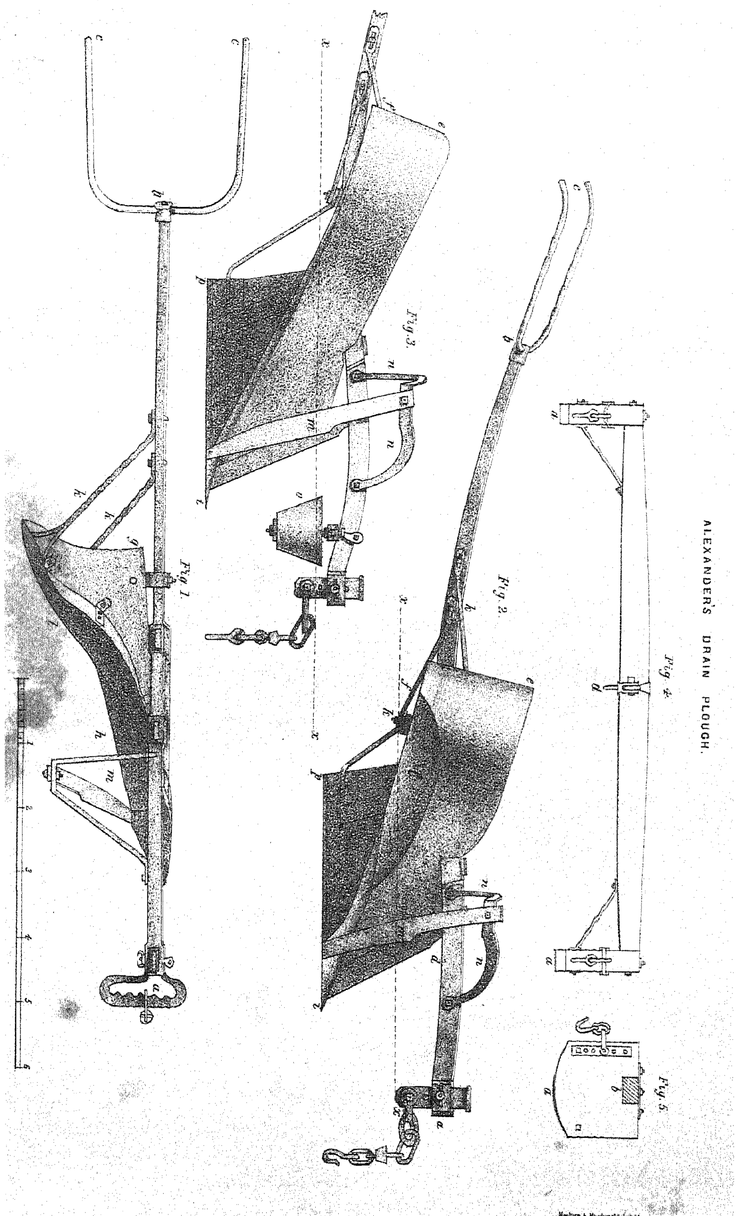
of soil, at a season, and, perhaps, in a way, never before thought of. And what is more in point, these new potatoes were found mealy and pleasant to eat, quite superior in taste and flavour to ordinary potatoes, early or late, of the same size. Samples of these new potatoes were also sent to the Highland and Agricultural Society's office in January, 1840, and a dish of that description was presented at the Society's Public Dinner in the Hopetoun Rooms in January, 1841.

DESCRIPTION OF A DRAINING PLOUGH by Mr Ebenezer Alexander, Taylorton, Stirlingshire.

[Premium, Twenty Sovereigns.]

The high importance of thorough draining, and the great extent to which it is now being carried, together with the heavy expense attending the operation, are producing constant calls for amelioration in the latter point. The casting or opening of the ground for the formation of the drain, though not the heaviest item in the list of expenses, forms yet a sufficiently formidable item to call for reduction. This operation has, for the most part, been, and in numerous localities must continue to be, an operation with the spade, but numerous attempts have, from time to time, been made to bring it more under mechanical influence; and for this purpose the plough, under a variety of shapes, has been tried with more or less of success. Seeing that no implement hitherto brought out for this purpose had possessed all the requisite advantages that were desired, and that a general desire still prevailed for an instrument of the kind, the Society offered a premium which appeared adequate to bring out the energies of practical men towards the attainment of this object, the result of which has been the production of the plough now to be described, and which seems to possess, in the opinion of practical farmers, a greater amount of capability for performing the operation required, than any implement hitherto adopted.

This plough, or rather ploughs, are represented in Plate I. and are described in general terms by Mr Alexander himself in the following words:—"This plough was first brought into operation in December, 1840; since then I have drained upon my own farm about seventy Scotch acres, and likewise above 200 acres to neighbours and others, performing, in general, the opening or casting out the drains, thirty feet apart, over one Scotch acre per hour; the depth varying according to the nature of the ground, but averaging about two feet two inches. The operation is most advantageously effected by using two such ploughs—


ALEXANDER'S DRAIN PLOUGH.
Fig. 1.
Fig. 2.
Fig. 3.
Fig. 4.
Fig. 5.

a leader and follower—the first taking out a depth of sixteen to eighteen inches, with a width of seventeen inches at top and seven inches at bottom. The second, or finishing plough, takes out the remaining depth of eight to ten inches, giving to the cut a width of five inches only at bottom, and without producing any change in the surface width. The earthy matters lifted in this second operation are laid on the surface, on that side of the cut opposite to where the products of the first furrow had been laid; and the cut is thus finished, with the exception of the cleaner or scoop being passed along the bottom before the tiles or drain stones are laid on. Though I have here described two ploughs as being required to complete the cut for a drain, either of those described may be used alone to finish a cut, by changing the sock and mould-board; and in using the plough in this way, it is proper to go over a-half or a day's work with the plough under the *first* form, and then to change the irons to the *second*, or finishing form, completing those cuts that have already got the first turn, before the plough is again altered to the *first* state. In practice, however, I prefer a plough of each kind complete, which allows the work to proceed more uniformly, and without the loss of time to man and horses.

"By removing the mould-boards and other outstanding attachments, these implements can be employed as subsoil ploughs; and though they have hitherto been principally used for cutting drains in strong and deep clay lands, they have also been successfully employed in *dry field* land, where the soil was free of large stones. The weight of each plough is about five hundred weight, and the price £9; but, with the additional mould-board and mounting for making the second cut, a single plough amounts to about £11.

"In comparing the expense of cutting drains by this implement and by the spade, if we take land that has had the drains laid in at fifteen feet separate, which gives forty-four chains of drain to the imperial acre, the price for cutting drains, of twenty-six inches average depth, with the spade, may be stated at 6¼d. per imperial chain, or 23s. per acre nearly. The expense of cutting out drains with my ploughs, which, with ten horses, are capable of finishing the drain-cuts of half a Scotch acre per hour, or of half an imperial acre in forty-eight minutes nearly, and equal to six and a-quarter acres per day of ten hours. Taking the expense of ten horses, together with men, at £3 : 15s. per day, gives the expense per acre 12s., shewing a difference in favour of the plough of 11s., being a saving of nearly one-half the expense of *cutting* the drains.

"It will be seen that the principle of these implements lies in their cutting the furrow or drain on both sides with coulters, and

gradually elevating the earth so cut and loosened upon the inclined plain of the mould-board, until it is thrown off by the latter, and deposited on the surface by the side of the drain.

"The implements have been in competition at several drain-ploughing matches, where they carried the first prizes; and I beg to submit herewith a number of certificates bearing upon the merits of the ploughs.* Perhaps it may not be out of place for me to state that they have also been recently introduced into England and Ireland, and in both cases with entire satisfaction."

In further describing these ploughs of Mr Alexander, there remains to be pointed out that fig. 1 is a geometrical plan of the first or leading plough, fig. 2 being an elevation of the same; and, as will be seen from inspection, the skeleton or frame of the implement is very similar to the subsoil plough. The beam, which is twelve feet in length from *a* to *b*, has a depth in the body parts of four and a-half inches, and about two inches in breadth, tapering from the coulter forward, to *a*, and from the body-frame backward, to *b*, to about three by one and a-half and two by one inch respectively. The handles, *c c*, add three feet more to the length of the plough, or fifteen feet in all. The main coulter, *d*, is inserted at two feet nine inches from the point of the beam, and from that to the hind part of the body the distance is two feet eight inches. The length of the sole, including the sock, is three feet six inches, and, when the plough is resting on the sole, the height of the beam at the coulter box is two feet nine inches, and at the point of the beam, and also at the lowest part of the body, it is two feet five inches, the height of the handles being four feet eight inches. The body, on the land side, from the coulter, *d*, to the hind part, is a uniform plain surface, lying in the plane of the beam; the sole-shoe, and sock are similar to those of the subsoil plough, but here, in the leader, the breadth of the sock is seven inches. The mould-board, *e*, which springs from the back of the coulter, *d*, extends backward and upward to a length of six feet from the point of the sock, its height at the hind part, from the sole line to the lower edge at *f*, is twenty-one inches, and its height, from *f* to *e*, twenty-two inches. The mould-board is not twisted as in the common plough, but simply bent into the curve exhibited in the figure. The flaunch, *g h*, fig. 1, which, together with the sock, form the inclined plane *i f*, of fig. 2, is a flat plate attached to the lower edge of the mould-board, serving, on the one side, to carry up the furrow slice, and on the other to support and strengthen the mould-board, which is further attained by the stays, *k k*. The angle

* It has been considered unnecessary to publish the certificates, but they are all expressed in terms of commendation of the plough.

plate *l*, is inserted in the angle of the mould-board and flaunch, and is worked to a concavity suited to assist in turning out the slice taken up by the plough. The second coulter, *m*, which cuts the right hand side of the drain, has its point inserted into the feather of the sock as a support to its point, while the head is sustained by the stays, *n*, at a width of about twenty inches from the land side of the beam. In working this plough, it is held with a slight inclination to landward.

Fig. 3 is an elevation of the furrow side of the body of the second or finishing plough, the tail of the beam and the handles being cut off. In construction, it differs from the *first* in nothing except the mould-board. In this, the mould-board is seven feet long, from the point of the sock, *i*, to the extremity, *e*, its height above the sole line, to the lower edge, *f*, is two feet nine inches, and from *f* to *e* eighteen inches. The flaunch, forming the inclined plane, is only four inches broad, while in the first it is eight inches, and the angle plate, *l*, is left out. The sock, in fig. 3, is reduced to five inches in breadth over the feather, and the coulter, *m*, is set at the same width below, five inches; while its distance from the land side of the beam above is sixteen inches, that this part may pass freely through the former cut. The conical roller, *o*, is also an appendage of the *second* plough, to serve the purpose of keeping the beam more steady when working at this great depth; the roller may be of wood, and about twelve inches diameter at the base, its height being nine or ten inches. The vertical axis, on which the roller turns, has its upper end fitted to slide right or left on a horizontal arm, which is attached to the beam, and is fixed at any point of the arm by a pinching screw.

Fig. 4 is a side view of the great master tree, which is immediately yoked to the plough, and to this again is attached the greater and lesser main and common trees, by which ten or twelve horses may be yoked. This great master-tree is twelve feet long, in the middle it measures ten inches by four inches, and it is furnished at each end with the skid blocks, *a a*, these, resting on the ground, form a sledge, upon which the tree travels over the ground.

Fig. 5 is an end view of the tree and skid, *b*, being a section of the end of the tree, and *a* the skid, which is about two feet long, twelve inches high, and four inches thick, is well supported by iron stays to the tree, and the outward lesser master-trees are hooked to the skids at *c*, while the centre one is hooked to the tree at *d*, opposite to the point of attachment to the plough.

PLANS AND SPECIFICATIONS OF COTTAGES.

The Gold Medal to the Most Noble the Marquis of Breadalbane.

The Silver Medal to Archibald Butter, Esq., of Faskally.

The Society offers its gold medal to the proprietor who, within certain districts, shall have erected the greatest number of improved cottages within a given period, under certain prescribed conditions.* In the county of Perth two competitors lodged claims—the Marquis of Breadalbane and Mr Butter of Faskally. The local committee of the Society's members, in charge of the competition for this county, submitted to the Directors a report in the following terms:—

"Your committee have great pleasure in expressing their satisfaction with the cottages of both proprietors, and now proceed to make some remarks on each.

The cottages on the Breadalbane estate consisted of two squares, one near Acharn, the other situated near Fortingall, about four miles apart, and also some detached cottages. All are built of stone, and slated, and the whole arrangements in them were found complete, combining every point to which the attention of your committee was directed by the conditions of the premiums, whether as regards situation, drainage, substantiality of structure, internal accommodation, or outward appearance.

Your committee have particularly to remark the excellent arrangements of the outhouses, each family having a lock-up shed for fuel, byre for a cow, and, in some instances, stall for a horse, pig-sties, &c. These accommodations, while in every respect suitable and sufficiently accessible, are all removed from the eye, and in no way interfere with the personal comfort of the cottagers.

Your committee feel great pleasure in observing that the cottages, in every instance, shewed the very marked improvement on the condition of the people induced by these commodious arrangements in place of the confusion, in the disposal of furniture and household utensils, generally manifested in Highland

* See List of Premiums.

cottages, everything was tidy in the extreme; and the presence of plain but neatly-arranged articles of utility and comfort, not usually seen in the possession of labourers in this district, still farther evinced a growing taste for domestic comforts, which cannot fail to be considered the very best proof of the prosperity and happiness of the inmates.

Your committee were highly delighted with the cottage system on the Breadalbane estate, so far as seen by them, and are unanimously of opinion that his Lordship is entitled to the highest praise for his exertions and taste displayed in this matter.

The cottages on the Faskally estate, in competition with those already mentioned, are situated in the village of Pitlochry. They consist of six or seven houses for labourers and for tradesmen. These cottages were all built of stone and slated, and placed in a row; and, so far, meriting the approval of your committee. They likewise combine the points of drainage, agreeable situation, suitableness of structure, internal accommodation, and outward appearance; they are, however, deficient at present in the out-door accommodations, but which your committee were informed are yet to be added.

The rent of these cottages appeared rather high for labourers, viz., £3 : 10s. or £4, for two rooms and a small garden. And, if this were lowered, so as to be within the reach of the labourer, your committee consider that the views of the Society would be more fully attained.

Your committee gladly repeat the remarks already made in regard to cleanliness and domestic comfort, as exhibited in the cottages at Pitlochry, proving that, if landlords will only provide what are necessary for a fit habitation, the cottagers will be sure to take advantage of the improved means to ameliorate their condition. Upon the whole, the example shewn here by Mr Butter is entitled to the best consideration of the Society; but, your committee, in conclusion, beg to recommend the cottages of Lord Breadalbane as entitled to the premium.

N. Menzies, *Convener*.
John S. Menzies of Chesthill.
James Menzies of Pitnacree.
Ar. Campbell, Camusearnie Cottage."

Castle Menzies,
31*st October*, 1842.

This report having been remitted by the Directors to the consideration of the standing Cottage Committee, the following is an excerpt from their report:—

"The gold medal offered to proprietors for building cottages in

the counties of Perth and Ayr has brought forward two competitors in the former county and one in the latter. The competitors in Perthshire were the Marquis of Breadalbane and Mr Butter of Faskally, and in both instances the expectations of the Earl of Rosebery, the originator of these premiums, have been completely realized, and the cottages, in every instance, shewed the very marked improvement on the condition of the people induced by commodious arrangements. As a pecuniary speculation, however, the cottages of Lord Breadalbane cannot be said to have been profitable. The average cost appears to have been about £65, while the rent, as is said in the report, ranges from £1 : 5s. to £2 : 10s., or £4, with an acre, to one and a-half acre of ground. This, however, may be no fair criterion of the return which might have been obtained had they been offered to competition. The cost and rental of the cottages built by Mr Butter are not stated so distinctly as to admit of an opinion being formed."

The cottages of Lord Breadalbane, alluded to in the foregoing report, are, as therein stated, principally arranged in two groups, one at Acharn and the other at Achloe, but there are also several detached cottages; and, in all, they are calculated to accommodate about thirty families, each family having at least two apartments in the cottage.

Plate II. fig. 1 is an elevation of a double cottage for tradesmen, forming part of the north side of the square at Acharn. The length of the two is forty-eight feet, the width twenty feet over walls, and the height of the side walls fourteen feet outside. Fig. 2 is a cross section of the same, together with the peat-houses, situate, in this case, immediately behind the cottages. The height of the apartments on the ground floor is eight feet, and of the second floor seven feet. Fig. 3 is a plan of the ground floor, together with that of the peat-houses, and fig. 4 is the second floor. In these, *a* is the kitchen of one house, and *b b* two rooms of the same on the second floor. *a'* is the kitchen of the other house, *b' b'* its two rooms, one of them on the ground, the other on the second floor; each house having three apartments, besides the closets *c* and *c'*. Of the four peat-houses, *d*, here represented, two belong to these cottages, the others belonging to two in another part of the square. As seen in section fig. 2, the peat-houses are covered in by a lean-to roof, which forms a continuation of the roof of the cottage.

Fig. 7 is an elevation of part of the east side of this square at Acharn, a portion of the range to the right being cut off in the figure, but, as executed, it forms a uniform facade; that to the right corresponding to the part shewn on the left in the figure, the whole extent being 160 feet, including the return parts. The

THE BREADALBANE COTTAGES.

Fig 1.

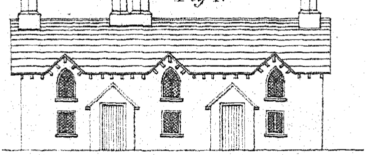


Fig 2.

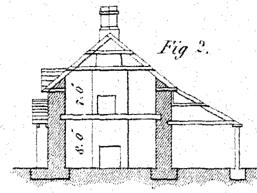


Fig 3

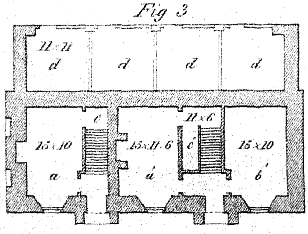


Fig 4.

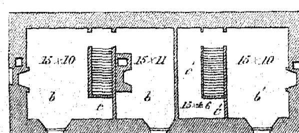


Fig 5.

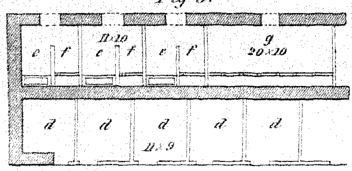


Fig 6.

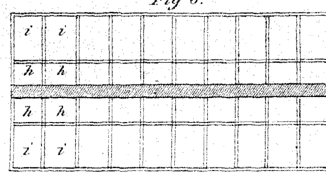


Fig 7.

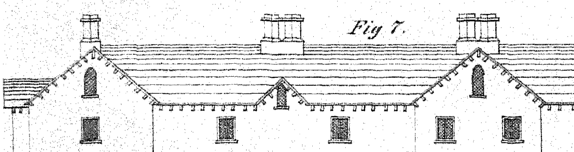


Fig 8.

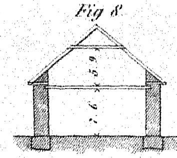


Fig 9.

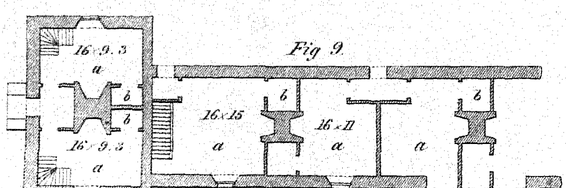
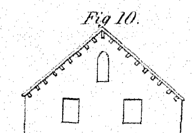


Fig 10.



10 5 0 10 20 30 40 50 60 feet.

THE BREADALBANE COTTAGES.

Fig 1. c.

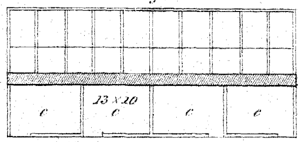


Fig 1. b.

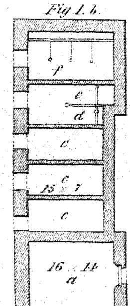


Fig 2.

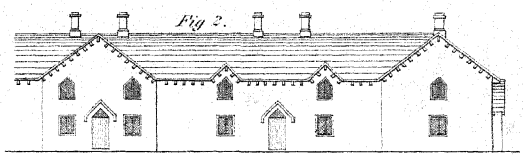
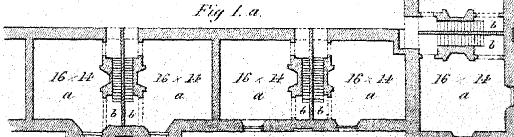


Fig 1. a.



Scale to Figs. 1. and 2.

THE FASKALLY COTTAGES.

Fig. 3.

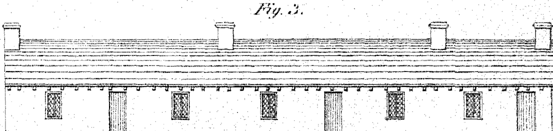
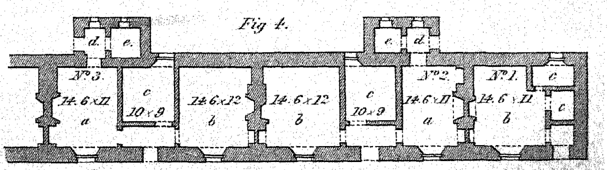
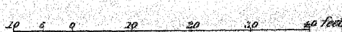


Fig 4.





Scale to Figs 3. & 4.

Maclure & Macdonald Lith^rs Glasgow

width, as before, is twenty feet; and, in this case, the side walls are only nine feet high outside, but there are still a ground and second floor, though the latter is not shewn in the plate, and as seen in section fig. 8, is only five feet nine inches high, and is very much contracted in the roof, while the ground floor has also a reduced height of seven feet six inches. Fig. 9 is the ground plan corresponding to that portion of the facade shewn in the elevation, fig. 7. The whole range contains ten families, five of whom are accommodated in the portion embraced in the figure. Each family has a kitchen, *a*, on the ground floor, but these are of various dimensions, and each of these has a closet, *b*, and a stair leading to a room right over the kitchen, and of the same size with it.

Fig. 5 is part of the plan of a range of peat-houses and byres, on one side of which there is a peat-house for each cottage, marked *d*, and on the other side a range of houses, part of which contain accommodation for a horse, *e*, and for a cow, *f*, while a portion, *g*, of this side is laid out as a common byre; this range of offices, which is ninety feet long and twenty-five feet wide, occupies the south side of the square, the cow-houses facing outward. Fig. 6 is the piggery, arranged for twenty sties, each having an inner apartment, *h*, roofed over, and an outer or open court, *i*, the whole occupying a length of fifty-three feet and a breadth of twenty-six feet. Fig. 10 is the east-end view of the cow-houses.

Plate III. fig. 1, *a b c* exhibits the ground plan of three sides of the square at Achley; the side *a* being partly cut off, together with the fourth side. Fig. 2 is an elevation of that portion of the side *a* shewn in the plan. Like fig. 7, Plate II., this forms, when complete, a uniform facade, which is 153 feet in length; the width, as before, is twenty feet, and the height of the side walls fourteen feet. In fig. 1 *a*, the ground plan of this facade, the whole length of the range of cottages, including the return at each end, is 193 feet, divided into ten cottages, six only of which are shewn in this figure, each consisting of a kitchen, *a*, on the ground floor. Each kitchen is provided with a closet, *b*, and a stair, leading to the second floor room, which is right over, and of the same dimensions as the kitchen to which it belongs. These second-floor rooms are not figured in the plate, but they have, likewise, a closet corresponding to that below. The internal accommodation in these cottages is, therefore, two fire apartments, of about sixteen feet by fourteen feet, and two small closets to each.

Fig. 1 *b*, contains three peat-houses, *c*; a cow-house, *d*, with

accommodation for a horse, *e*, and a common byre, *f*, arranged for four cows. On the opposite side of the square, or that part which is cut off in the figure, the same amount of accommodation is provided, each division of these offices being forty-three feet long and twenty feet wide. Fig. 1 *c*, the fourth side of the square consists of four more peat-houses, *c*, towards the interior, and of a piggery of ten sties, each consisting of a covered shed and an open court as before. The extent of this division is fifty-five feet in length and twenty-five feet wide.

The cottages built by Mr Butter, consist of a range of connected cottages, of which an example is given in Plate III. fig 3, and of several detached cottages for tradesmen, with workshops and other appurtenances. Fig. 3 presents, perhaps, the least striking example of this set; but want of space prevents the giving a greater extent of illustration. The internal accommodation is here obtained entirely on the ground floor, and varies in extent from one fire apartment, with closets, to two with a large closet, and other external accommodations. The elevation of this range is marked by the simplicity of its architecture, making no assumption of external decoration; the chief object being comfort and convenience within. Fig. 4. The ground plan of these cottages shews the internal arrangement, wherein *a* marks the kitchen of each, *b* the sleeping rooms, and *c* the closets, *d* is the porch of a back entrance from the detached offices, and *e* a coal or peat-house attached to the back entrance porch, or it may be used for any other purpose connected with the kitchen. In the cottage No. 1, fig. 4, the accommodation is adapted only for a small family, there being only the kitchen and two closets. In Nos. 2 and 3, the accommodation is more ample, there being a kitchen, one-fire sleeping-room, and a large light closet. The detached offices of these are not given in detail, but, judging from the example of other and detached cottages, it is presumed that peat-house, byre, piggery, &c., are all provided.

Of the tradesmen's cottages built by Mr Butter, there is one for the smith, consisting of three fire apartments, and a light closet, smithy, barn, stable for horse and cow, pig-house, and manure court, with coal and peat-house, and a garden in front of the cottage, while the offices are placed in the rear.

The foregoing description is intended to convey a knowledge of the design and arrangement of the different plans here illustrated; and the details of construction, as selected and condensed from the several specifications, and rendered applicable to all or any of the plans, will be found in the following general

Specification of Materials, Construction, and Workmanship.

Mason Work.

Excavation.—Trenches for the foundation of all the stone walls are to be dug out to the depth of twelve inches below the natural surface of the ground, or further if necessary, to obtain a firm foundation, and of a sufficient width to receive the foundation courses.

Foundations.—The foundation courses are to be laid with large flat-bedded stones, bedded and firmly packed in mortar, and of such breadth as to form a footing or scarsement of four inches on each side, when the walls of the superstructure shall be set off at the thickness specified, as marked on the plan; and these footings are to be four inches below the level of the floor.

Walls.—The walls are to be built in good rubble work, of thickness agreeable to specification, or as marked on the plans; and the stones all laid on their natural bed, and full-bedded and packed with mortar; chimney jambs, and jambs of doors and windows, soles, lintels, and outside corners, to be all neatly dressed with the chisel if freestone is used, or with the hammer if whinstone; all scontions or interior corners hammer-dressed, and the whole work carefully pointed.

Drains.—A drain fifteen by twelve inches, built in rubble with mortar, having the bottom paved, and close covered with flag stones, is to be formed at the distance of twelve feet from the doors, and extended to a proper outfall. An eye with iron grating, fixed in stone, is also to be formed between every two doors, to carry off surface and waste water.

Vents.—The vents from the kitchen chimney are to be ten by fifteen inches, and those of other apartments ten inches square, all carefully plastered with haired lime.

Chimney-tops.—The chimney-tops, if built of whinstone, are to be neatly coursed and hammer-dressed; if built of sandstone, they are to be neatly dressed with the chisel; and, in either case, are to be finished agreeably to the drawings, and raglets for lead are to be cut in the base of the chimney-tops to the rake of the roof, three quarters of an inch in depth.

Hearths.—The hearths are to be of flagstone, neatly dressed and close jointed, and well bedded in mortar.

Ground-flooring.—Before laying the composition floors of the ground story, the entire area within the walls is to be filled up with small stones, to within four inches of the floor line, and regularly levelled at this height. The composition for the floors is to consist of equal parts by measure of slaked lime, smithy ashes, and road scrapings, properly mixed and worked up with a due proportion of water. The composition thus prepared is

to be spread over the surface of the broken stones to the thickness of four inches, carefully levelled and rubbed in until all cracks disappear.

Sundries of Mason Department.—Foot-steps of stone of not less than fifteen inches square and eight inches in depth are to be provided and laid for the feet of all posts in peat-houses, stables, &c., having a sunk seat of one inch deep for the foot of the post; iron gratings for drains are also to be furnished, and all bat-holes to be cut, and the beam-filling of wall-heads in rubble, with mortar, is likewise to be done by the mason. An area of twelve feet in breadth along the front of the cottages is to be neatly causewayed, and in like manner the floors and areas of the byres and piggeries.

Carpenter Work.

Safe-lintels.—Safe-lintels are to be laid over the voids of doors and windows, their thickness being one inch for every foot in length, and their breadth equal to the space so lintelled over, with a wall-hold of nine inches.

Joisting and Flooring.—The joisting of the second floor is to be eight by two and a-half inches, dressed and set at seventeen inches apart, having one foot of wall-hold. The flooring to be one and a-quarter inch deal, dressed on both sides, tongued and grooved in the joints, close laid, and well nailed with 15 ℔ blind nails.

Roofing.—Cantalivers of six by two and a-half inches are to be dressed and laid in the walls, projecting twelve inches, and sixteen inches apart. Wall-plates of five inches by two inches are to be laid above the first beamfillings of the cantalivers, and well nailed thereto. Rafters are to be six and a-half inches by two and a-half inches; balks, six by two inches; the couples being well bound together, secured at each joining with two 36 ℔ nails, and set in the roof at sixteen inches apart. The rafters of the roofs of offices, including peat-houses, byres, and piggeries, to be of the same scantling, joined and secured in the same manner, and set at the same distance apart; and where the office roof is a lean-to, ranging with the house roof, the head of the rafter is to be securely nailed to the foot of those in the principal roof, the foot of the lean-to being set on a wall-plate six inches by one and a-half inch. The whole roofing is to be covered with three-fourth inch sarking boards, laid close, and well nailed with 10 ℔ nails.

Windows.—The windows are to be framed with a central mullion, forming two sashes, one of which is be to be fixed, the other opening on hinges, which are to be of brass, three inches long. The fastenings to be a thumb-sneck, with a brass ring for open-

ing the sash. The mullions are to be four and a-half by two and a-half inches, with soles and cases in proportion; the sashes two inches thick, and made to receive the zinc or cast-iron casements fitted to the checked sole of the case, and finished with weather-board at bottom, and the sole channelled and throated outside to throw back rain-water. The casements are to be glazed with best second glass, carefully bedded and filled with oil putty; the glass seats having been previously painted with whitelead.

Stairs.—The stairs leading to second floors are to be constructed with stringers of one and a-half inch thick, steps and risers of one inch, with a nosing, and dressed and properly secured. The steps being nine inches broad, and risers seven inches.

Partitions and Ceilings.—The partition walls dividing the cottages from each other, are to be of brick laid on bed, or of standards and concrete, five inches thick, laid between temporary boarding, the standards two feet apart. Partitions between rooms of the same cottages to have standards four by two inches, set at fourteen inches apart, and lathed with sawn laths, not exceeding one and a quarter inch broad; and ceilings of second floors are to be lathed in the same manner, fixed with wrought nails; partitions of stairs to have standards as above described, lined over with three-fourth inch boarding, dressed, tongued, and groved, and beaded in the joints. The partitions of offices to be formed with slabs, or with rough boarding securely nailed upon standards or on rails at top and bottom.

Doors.—The outside doors are to be framed in halves, of one and a-half inch deal, and boarded on the outside with one inch deal, tongued, and groved, and beaded; to be hung to door-posts four by two inches, with eighteen inch T hinges, and fastened with a good stock-lock and thumb-latch, value 2s. 6d. Inside doors to be made of three-fourth inch deal, tongued, and groved, and beaded, and nailed upon three bars. These doors are to be hung to door-frames of five by two inches, with fifteen inch T hinges, and fastened with thumb-latches, those of rooms having also small stock-locks. The doors, and whole front of peat-houses are to be finished with rough boarding nailed upon bars, the joints being one inch open; peat-house doors being also furnished with a stock-lock.

Offices.—The offices are to be divided and arranged as laid down in the plans. The divisions in common byres and stables to be of one and a-half inch deal, the travis posts being six inches diameter. The hay-rack to be placed below, along with the manger, and fitted up in the usual manner. The front of peat-houses is to be constructed with post and boarding, the posts are to be eight inches diameter, set in the foot-steps as before described, and to be surmounted with a wall beam eight by six inches, laid upon the

head of the posts, and secured thereto by oak trenails, the boarding to be applied in the rough state, nailed to the wall plate, and to rails extending between the posts, the joints being one inch open. The floor of byres, stables, and piggeries, is to be laid with rubble causeway, due provision being made for drainage and removal of soil and manure.

Slater Work.—The roofs are to be all covered with the best blue slate from Birnam quarries or from any other of equal quality. The slates are to be properly dressed and laid with a cover of two and a-half inches at the eaves and two inches at the ridge, nailed with 10 lb. nails that have been thrown, when hot, into lintseed oil; the slates at the eaves and skews are to be double nailed; the ridges and flanks to be covered with sheet zinc of one pound per square foot, and of a breadth not under sixteen inches, secured with zinc nails. Flashings of sheet lead, ten inches broad, of the weight of five pound per square foot, are to be put round the base of the chimney-tops, securely fixed into the prepared raglets, and then pointed with mastic.

Plaster Work.—All the walls of the apartments in the cottages are to be rendered with haired-plaster lime and rubbed in. Lathed partitions and the ceilings of upper rooms are to be plastered with two coats. The plaster-lime is to be prepared with fine sand and a due proportion of hair.

Painting.—All external wood-work, as doors, windows, cantalivers, &c., are to be painted three coats of good oil paint, of an approved colour. The doors and other external wood-work of the offices to get two coats of coal tar, and on receiving the first coat of tar, it is to be dusted over with clean dry sand thrown forcibly upon it.

Materials.—The stone used in the buildings are to be of the best quality that the agreed on quarries produce, whether for common rubble or for principal stones; the mortar is to be prepared from the lime procured from the lime-works of ——— properly burnt, and to be prepared by slaking and tempering with due proportions of clean sharp sand and fresh water, well worked together. The joisting, safe-lintels, roofing, flooring, windows, and outside doors, standards of partitions, door posts and stairs, and other exposed parts, to be all of well-grown larch or Baltic timber, inside doors and partitions, and other internal upfittings, may be of good Scots fir or of yellow pine, and are to be all of the best quality of their several kinds.

General Conditions.—The mason's estimate is to embrace all the parts already specified under that department. The carpenter is, in like manner, to embrace in his estimate all that is already specified under carpentry, together with slater, plumber, glazier, plasterer, and painter's work, and works connected with any of these;

and he is besides to furnish all scaffolding, centring, and the like materials, for the works, tressels for such scaffolding excepted.

It is likewise to be understood that the contractors respectively are to furnish and provide their share of materials, tools, implements, labour, carriages, and every other thing whatever, requisite for the completion of their contracts; they receiving the agreed on price in such manner, and by such instalments, as may be agreed to.

The whole of the works herein specified are to be completed in a substantial and workmanlike manner, according to the plans and specifications, and to the entire satisfaction of such person as the proprietor may appoint to inspect the same; the said inspector being also empowered to judge of the quality of all materials and workmanship, and to instruct and decide upon any matter or point in these plans and specifications that may appear obscure or to require explanation, the decision of the inspector on all such points being final; and the whole works are to be completed within the agreed on time, under a penalty of £———.

Statement of the Cost of Cottages Built by the Marquis of Breadalbane in the neighbourhood of Taymouth, from 1839 *to* 1842.

1st. Ten cottages on east side of the square at Acharn, each with two apartments. See fig. 7, Plate II.						
Amount of contract for masonry, . . .	L.133	6	3			
Do. do. for carpentry, &c., . .	258	1	11			
				L.391	8	2
2d. Two cottages on north side of the square, each with three apartments, and offices attached. See fig. 1, Plate II.						
Amount of contract for masonry, . . .	L.28	11	0			
Do. do. for carpentry, &c., . .	110	9	9			
				139	0	9
3d. Cottage for three families on north side of road each with two to three apartments, besides a carpenter's shop and timber-store,						
Amount of contract for masonry, . .	L.72	18	0			
Do. Do. for carpentry, &c., .	135	9	2½			
				208	7	2½
4th. Separate contracts for detached offices for the above, including mason, carpenter, &c., . .				142	14	2
5th. Charges common to the foregoing :—						
Excavating earth on the stance of offices, making drains, laying composition floors in cottages, . .	L.29	8	7			
Causewaying byres and front of cottages, .	2	16	2			
Carriage of Materials, ...	6	14	2			
Lead, zinc, &c., ...	34	9	4½			
Zinc windows, ...	12	16	9			
Ironmongery, ...	9	11	0½			
Small furnishings by smith, glazier, and plasterer,	6	15	7			
Iron grates for drains, ...	2	17	7½			
				105	9	3½
				L.986	19	7

This sum, divided over the fifteen cottages, gives an average cost for each, including offices, of £65 : 16s., but by dividing the cost of the offices and the contingencies over the whole equally we have for out-door offices about £17 : 4s. to each cottage; and this, added to the cost of one cottage of each class, gives a total of £56 : 8s. for each cottage of *two* apartments with offices, and of £86 : 14s. for those of *three* apartments and offices.

Statement of the Cottages Built as above at Achloe, near Comrie, for the accommodation of Ten Families, see figs. 1, 2, *Plate III.*

Amount of contract for masonry,	L.374	4	0	
Do. do. for carpentry,	430	19	1½	
Window frame and filling,	12	6	1	
Mason, carpenter, and slater work of peat-houses and piggeries,	36	0	0	
Excavating earth and draining,	11	15	7	
Lead and lime for roofs,	15	2	3½	
Zinc windows,	12	0	0	
Ironmongery,	12	7	7½	
Plasterer, for furnishings,	2	3	0	
				L.906 17 8½

The cost of each cottage in this class is, therefore, £90 : 13 : 9, including offices, and though they have each but two fire apartments, these are considerably larger than the former, being not less than sixteen by fourteen feet, whereas in the Acharn cottages the fire apartments are only from nine to twelve by sixteen feet.

As regards Mr Butter's cottages at Pitlochry, it is to be regretted that sufficiently detailed statements have not been furnished, to yield satisfactory results as to their cost of erection ; and the plans submitted being so varied in point of extent, it becomes difficult to fix a medium rate of cost; but as examples of commodious and economical cottage building, they are deserving of every attention.

REPORT ON THE IMPROVEMENT OF WASTE LAND ON THE FARM OF NETHER SAVOCK.

By Mr Roderick Gray, Peterhead.

[Premium, Piece of Plate of Seven Sovereigns value.]

The reporter entered into a lease of the farm of Nether Savock, on the estate of Faichfield, in the parish of Longside, county of Aberdeen, at Whitsunday 1838, for twenty-one years and crops. The extent of the farm was 491 acres, 3 roods, and 36 poles; whereof 211 acres, 3 roods, and 11 poles were arable; 178 acres and 3 roods heath and bog; 97 acres and 3 roods deep moss; and 3 acres, 2 roods, and 25 poles roads. This extent was increased by some small additions in the straighting of marches, and it now (October, 1843) amounts to 500 acres and 12 poles; whereof there are 336 acres, 2 roods, and 12 poles arable; 29 acres, 2 roods, and 22 poles heath and bog; 99 acres, 1 rood, and 26 poles deep moss; and 4 acres, 1 rood, and 32 falls roads, &c. In the course, therefore, of five years, 124 acres, 3 roods, and 1 pole have been brought into cultivation by the reporter, besides a further extent in the course of cultivation by two crofters, on patches of the moor ground subset by him.

The proprietors having agreed to make certain advances for roads and drainage, the reporter, by his lease, became bound to pay interest on these advances, and to bring into cultivation 70 acres of the waste land; and the proprietors having further agreed, at a subsequent period, to advance £4 : 10s. per acre, for each of other 40 acres, for roads, drainage, and in part of the expense of cultivation, the reporter undertook to bring other 40 acres into cultivation—extending in all to 110 acres.

Description of the Waste Land.—The Hills of Savock, as they were named, although their elevation is very inconsiderable, were covered with heath and dead moss, bog and quagmire, the dry parts resting on a muirband-pan, or feruginous incrustation, between the moorish soil and subsoil, and the lower parts floating upon liquid clay or quagmire, and producing rushes and the coarser aquatic grasses. The subsoil is a mixture of clay and gravel, in some places the mixture having a preponderance of clay and in others of gravel.

Roads.—The first operation was to form and make roads, as without these the land was an inaccessible waste, totally worthless for agricultural purposes, and for any other purpose not worth above sixpence of rent per acre. The sum laid out upon roads was £101 : 6 : 7.

Ditches.—After roads had been made, the next step was to make large ditches, varying from twelve feet wide by six deep, to

eight feet by four. These ditches extend to 14,607 yards, and cost in all £250 : 8 : 9. Connecting with these, ditches of smaller size were required, as well as sunk drains built of stone, and having an opening to allow the water more freely to escape.

Ploughing.—After the land had become sufficiently firm to admit of cattle treading upon it, the reporter began to trench-plough it with oxen; endeavouring, as far as possible, in the course of his operations, to break the muirband-pan, and take up a portion of the subsoil. This was done in the summer and autumn—the boggy parts in the summer, and the hard and dry parts after the rains in autumn—as it would have been impracticable to penetrate the muirband-pan when the land was dry. The reporter, to a small extent, found it advantageous to dig the boggy parts with the spade, where the soil had not become sufficiently consolidated to admit of being ploughed.

After being trench-ploughed, the land was allowed to remain in a rough state, exposed to the pulverizing effects of the frost and rains of winter, and next spring or summer the furrows were broken by the grubber, and the land again trench-ploughed across, and either reduced again by the grubber and fallowed, or, where found necessary, exposed to the effects of another winter, and fallowed the summer thereafter.

When the ground had been sufficiently pulverized and exposed to the action of the atmosphere, and the moorish soil mixed with a part of the subsoil, it was then dunged and limed, and a crop of turnips or oats sown.

The land will now be kept in a rotation of five or seven course shift; one part of the farm is under a seven-course and another under a five-course shift.

The reporter, in all cases where practicable, in cultivating waste land, would, according to his experience, prefer ploughing to trenching with the spade and mattock, for the following reasons:—1*st*, Ploughing is a cheaper method than trenching; 2*d*, Trenching does not supersede deep ploughing and fallowing, for it is necessary to trench-plough to the depth of the trench made by the spade, in order that the soil may be pulverized, mixed, and exposed to the action of the atmosphere; 3*d*, If there are stones in sight, they are easier quarried and removed before the surface is broken than when they are placed on the surface of trenched land; and 4*th*, There is not much land, at any considerable distance from a town, that will bear the expense of trenching by the spade; and, 5*th*, It has been found that land, which had been supposed to bid defiance to the plough, has been brought into cultivation by the plough alone, after taking the proper preliminary steps of drainage and removing the stones before beginning to plough, and not attempting to plough while the land is hardened by drought.

The comparative expense of trenching by the spade and ploughing, in ordinary cases of moorland, such as now reported upon, may be estimated as follows:—

Trenching, per acre, ...	£6	8	0
Ploughing twice, harrowing, and grubbing,	2	8	0

The ploughing, preparatory to sowing the land, would be rather more after trenching than after it had been twice ploughed, harrowed, and grubbed.

The whole of the land brought into cultivation was limed at the rate of seventy-two bushels of lime-shells per acre, and manured with a mixture of court-yard dung, compost of earth and moss, herring refuse and sea-weed; and, in addition to these, over a considerable extent, twelve bushels of bone-dust per acre.

The average expense of bringing the land into cultivation, including roads, ditches, drains, manure, and seed, per imperial acre, amounts to	£10	17	7½
And the average returns of the first crop of oats, as nearly as the reporter has been able to make them up, not having kept a separate account for each field, are two and a-half quarters per acre, which he estimates, including fodder, at 22s. 6d. per quarter, ...	2	16	3

One field in turnip, crop 1842, he estimated as being worth £3 : 10s. per acre, and the crop of oats this year he estimates at three and two-eighths quarters per acre.

Another field was in oats, crop 1841; and as he could not, in consequence of the state of the other parts of the farm, prepare it for turnips in 1842, it was sown with grass-seeds with the first crop; and this grass, in 1842, was worth 10s. per acre, and this year about 7s. 6d.

A third field was sown out with the first crop in 1842, for the reason before mentioned, and has been in pasture this year, and estimated worth 15s. per acre.

The reporter having, as a tenant, brought into cultivation upwards of 450 acres of waste land, he is of opinion that, under liberal encouragement, the extent of tillage in Scotland may be greatly increased, perhaps doubled, the labouring classes much benefited, and the resources of the country considerably augmented.

The reporter has observed, in many localities, that waste land, in the composition of its soil, is nowise inferior to what is already in cultivation—in some cases it is superior. Of course it wants vegetable mould, but this may be supplied in some measure from the herbage on the surface, whatever it may be. The swampy and boggy lands, after the hollows are dry, are in general supe-

rior to the higher lands, being composed of soil washed by the rains from the higher grounds, and covered with moss and the coarser grasses. But, on the sides of hills or rising grounds, there is often a great depth of clay mould, which requires only to be broken, exposed to the action of the atmosphere, and to have lime and compost added to it, to produce crops.

Were roads made through large tracts of moorland, and were the land drained and divided into moderate sized allotments, of from ten to twenty acres each, and were an allowance of from £20 to £30 to be given for erecting houses, (and suitable houses could be erected for either of these sums, according to circumstances,) there would be no difficulty in letting such allotments to industrious and active tenants, who, at the commencement, would pay interest on the sums advanced for roads, drainage, and houses, and which should be the only rent charged for the first ten or fifteen years, according to the quality of the land; and for the remainder of a twenty-one years' lease, they would be able to pay 5s. to 6s. per imperial acre. In most cases, at the end of such a lease, the land would be worth 8s. to 10s. per imperial acre.

Where waste land adjoins farms, it should be let to the tenants of the farms for improvement upon the same terms as to crofters. In many cases it might be advantageous to the landlord not to charge any rent during the currency of a nineteen or twenty-one years' lease, inasmuch as he would get additional rent at its termination, for what otherways would be of little value, and he would thus afford employment to labourers, improve the climate, and add to the value and beauty of his estate.

ON THE REARING OF CATTLE, WITH A VIEW TO EARLY MATURITY, AS PRACTISED IN BERWICKSHIRE.

By Mr John Wilson, Edington Mains, Berwickshire.

The valley of the Tweed has long been famed for the rearing and fattening of cattle, its rich pastures, warm turnip-soils, and proximity to England, affording peculiar facilities for prosecuting this branch of rural economy. The "short-horns" were early introduced into it, and soon became its established breed; and, though still inferior to the Tyneside herds in symmetry, colour, and grazing quality, yet nowhere, perhaps, are they brought to market, at two years old, in such perfection of weight and fatness.

The production of beef, at the quickest and cheapest rate, being the object in view, the first requisite is a stock of cows

possessing qualities suitable for this purpose. Accordingly, they should be good milkers—able to keep at the rate of two and a-half to three calves each—of a kind known to have a tendency to fatten readily, and to come early to maturity, and of a structure likely to produce a vigorous well-grown steer. In other words, they must be good short-horns; only having more regard to their milking properties than is usually done by breeders of bulls. And here it may be well to notice, that it is in general highly inexpedient for the beef-grower—the farmer who depends largely on his regular cast of fat cattle—to attempt breeding his own bull. It is only a few individuals in any district who have the taste and skill requisite for this difficult department of the business, not to mention the large capital which must necessarily be invested in it, the precariousness of the return, the greater liability to casualties of such high-bred animals, and the additional expense of their housing and maintenance. On Tweedside, the breeding of bulls is confined to a very limited number of persons, chiefly Northumbrians, who, by devoting their whole attention to this department, are able, from year to year, to furnish a class of bulls which are steadily improving the general breed of the district. The contrary practice is at this moment compromising the character of this valuable breed of cattle in several districts of Scotland into which they have been more recently introduced. Made wiser on this point by experience, the farmer of the Border purchases from some breeder of established reputation a good yearling bull, which he uses for two or three seasons, and then replaces by another in like manner. This bull serves his own cows and those of his hinds, and some of the neighbouring villagers; and thus, though his own stud be limited to six or eight cows, he can select from the progeny of his own bull as many calves as he requires to make up his lot, and has them more uniform in colour and quality than could otherwise be the case. As the male parent, among sheep and cattle, is known to exert by far the greatest influence in giving character to the progeny, and increasingly so in proportion to the purity of his breeding, it is evidently much for the advantage of the beef-grower to spare no reasonable trouble and expense in obtaining a bull of thorough purity, and then to select his calves with the most scrupulous attention. From overlooking all this, how often may lots of cattle be seen, on the best of land, too, which can only be fattened at an enormous expense of food and time, and, after all, are so coarse in quality as to realize an inferior price per stone. Occasionally a few beasts of the right sort will be seen in such lots, which, by going ahead of their fellows, to the extent of £4 or £5 a-piece of actual market value,

shew what might have been done by greater skill or attention on the part of the owner.

It is very desirable to have all the cows to calve betwixt 1st February and 1st April. If earlier, they will get almost dry ere the grass comes, and calves later than this will scarcely be fit for sale with the rest of the lot. When a calf is dropt, it is immediately removed from its dam, rubbed dry, with a coarse cloth or wisp of straw, (this being what the cow would do for it with her tongue, if allowed,) and then placed in a crib in the calf-house among dry straw, when it receives a portion of its *own mother's* first milk, which, being of a purgative quality, is just what is needed by the young animal. For a fortnight, new milk is the only food suitable for it, and of this it should receive a liberal allowance thrice a-day; but means should now be used to train it to eat lintseed-cake and sliced Swedish turnip; and the readiest way of doing so is to put a bit of cake into its mouth immediately after getting its milk, as it will then suck greedily at anything it can get hold of. By repeating this a few times, and placing a few pieces in its trough, it will usually take to this food freely, and, whenever this is the case, it should have as much as it can eat, that its allowance of milk may be diminished, to meet the necessities of the younger calves which are coming in succession. This is of the greater importance that it is always most desirable to avoid mixing anything with their milk by way of helping the quantity. When a substitute must be resorted to, oatmeal porridge mixed with the new milk is perhaps the best. Sago has of late years been much used for this purpose; but an eminent English veterinary surgeon has recently expressed a very decided opinion that its use impairs the digestive powers of the animal and predisposes to disease. The sour smell invariably found in a calf-house, where porridge or jelly of any kind is mixed with the milk, is proof sufficient that indigestion is the consequence. An egg put into each calf's allowance, and mixed with the milk by stirring with the hand, is a good help, and never does harm; but, with this exception, it is best to give the milk warm and unadulterated, however small the quantity, and, along with this, *dry* farinaceous food, turnips and hay, *ad libitum*. If more liquid is needed, a pail with water may be put within their reach, as this does not produce the bad effects of mixed milk. Indeed, in this, it is best to keep as closely as possible to the natural arrangement according to which the calf takes it suck—at first frequently, and then at longer intervals, as it becomes able to eat of the same food as its dam.

The diet of the cows at this season is a matter of some consequence. Swedish turnips yield the richest milk, but it is too

scanty, and calves fed on it are liable to inflammatory attacks. Globe turnips should, therefore, form their principal food during the spring months. Care must also be taken that they do not get too low in condition in the autumn and winter, and for this end it is well to put them dry *at least* three months before calving. Some may think this long; but, on a breeding farm, milk is of little value at this season. The cows, when dry, are kept at less expense, and, by this period of rest, their constitution is invigorated, greater justice done to the fœtus, now rapidly advancing to maturity, and so much more milk obtained after calving, when it is really valuable.

When the calves are from four to six weeks old, they are removed from their separate cribs to a house where several can be accommodated together, and have room to frisk about. So soon as the feeding-yards are cleared of the fat cattle, the calves are put into the most sheltered one, where they have still more room, and are gradually prepared for being turned to grass; and, when this is done, they are still brought in at night for some time. At six weeks old, the mid-day allowance of milk is discontinued, and at about fourteen weeks they are weaned altogether. When this is done, their allowance of lintseed-cake is increased; and, as they have been trained to its use, they readily eat enough to improve in condition at this crisis, instead of having their growth checked, and acquiring the large belly and unthrifty appearance which used to be considered an unavoidable consequence of weaning. The cake is continued until they have so evidently taken with the grass as to be able to dispense with it. They are not allowed to lie out very late in autumn, but, as the nights begin to lengthen and get chilly, are brought in during the night, and receive a foddering of tares or clover foggage. When put on turnips, the daily allowance of cake (say 1 lb. each) is resumed, and continued steadily through the winter and spring, until they are again turned to grass. This not merely promotes their growth and feeding, but (so far as the experience of five or six years can determine the point) seems a specific against black-leg, which was often so fatal as altogether to deter many farmers from breeding. It may be well to state here distinctly the particular purpose for which cake is given at the different stages of their growth. At first, the object is to accustom them to a wholesome and nutritious diet, which will supplement the milk obtained from any given number of cows, so as to admit of a greater number of calves being reared, and, at the same time, have greater justice done them than could otherwise be practicable. At weaning-time, again, it is given to help the young animal over the transition from milk to grass alone, without check to growth or loss of condition. During the following

winter, however, the special object of its use is to prevent black-leg, as, but for this, turnips *ad libitum* would be sufficient.

When put to grass as year-olds, they decidedly thrive better on sown grass of the first year than on old pasture, differing in this respect from cattle whose growth is matured. They are laid on turnips again as early in the autumn as these are ready; and it is a good practice to sow a few acres of globes to be ready for this express purpose. It does well to give the turnips upon the grass for ten or fourteen days before putting them finally into the feeding-yards; and then, if they can be kept dry and warm, and receive daily as many good turnips as they can possibly eat, (globe till Christmas and Swedish afterwards,) they will grow at a rate which will afford their owner daily pleasure in watching their progress, and reach a weight by the 1st of May which, if markets are favourable, will reward him well for all his pains.

The leading features of this system are, *uniform good keeping* and *progressive improvement;* in other words, to get them fat as soon after birth as possible, and keep them so till they reach maturity. The details given above are a description of the expedients generally adopted by the breeders of this district for securing these objects.

REPORT OF AN EXPERIMENTAL TRIAL OF SIX VARIETIES OF PRIZE WHEAT.

By Mr James Waldie, Millisle, Wigtonshire.

Having, by permission of the Directors of the Highland and Agricultural Society of Scotland, obtained, through their seedsman, Mr Lawson, five varieties of seed wheat, being portions of those which gained the Society's premiums at Edinburgh, in October, 1842; and having also, with the view of following up more fully and accurately the tenor of the suggestions of the judges, (who awarded the premiums,) procured a quantity of Hopetoun, or what is here called Hunter's improved wheat, direct from Haddington market, in order to test the whole with more minuteness, as being all procured from the same part of the country, and raised in the same climate, and that also in preference to any of the other varieties which have been grown one or more years in this district, and which latter, from various experiments made by the writer, have been found not so safe a criterion to calculate upon a comparative trial as the seed procured from the Lothians, for the changed seed invariably produces a bet-

ter return, and generally ripens a few days earlier; with these preliminary averments, I proceed to detail the ultimate results.

Four of the varieties, viz., Chidham, Danzig-woolly-eared, Pearl, and Hopetoun, were white wheat, and the Belgian-new-red, and Blood-red, as their names indicate, were red wheats.

Twelve adjacent ridges of land were ploughed for the comparative trial, and two continuous ridges of twenty-one feet each in width, and equal in all respects, were allotted for the sowing of two bushels of each variety, on a thin light clay-soil incumbent on a porous subsoil, and comprehending an area of two roods and eighteen poles imperial—the preceding crop having been potatoes, and manured with a mixture of the dung of horses, cattle, and pigs, coal-ashes, and a little sea-weed, all carted from the village of Garlieston, and applied thereto at the rate of twenty-five tons twelve hundred-weight per imperial acre.

All the wheat were sown on the 17th of November, and harrowed under the same circumstances; and all the varieties brairded equally on the 9th December, but the woolly-eared and Hopetoun, for some weeks after, scarcely exhibited so rich a verdure as the others, which appeared without any distinguishable difference.

It was found, however, in the course of the ensuing spring, that the two red did not tiller so well as the white wheat, and especially the Blood-red, which retained a thinness throughout, particularly on the sides of the furrows. Had the soil been more tenacious, the red wheat would, in all probability, have succeeded better.

With respect to coming into flower, a chance head of all the varieties of white wheat could be seen shooting into ear by the end of June, still none of the kinds alluded to could be said to be in ear till the 1st of July, when all the white were pretty regularly shot out, and, the weather being peculiarly favourable, nearly the half of the ears were in flower, but those of the woolly-eared appeared somewhat to predominate; while, at the same time, a decided lateness in the red varieties was strikingly perceptible, and, ultimately, the Belgian proved to be seven days later in coming into flower than the white varieties, and the Blood-red four days later than the Belgian.

After the middle of July, the weather proved wet and ungenial, during which period rust was strikingly apparent on the heads of the woolly-eared, while the Pearl seemingly altogether escaped; though on the Chidham and Hopetoun a very slight tinge might be said to be discernible. The red varieties were not in so forward a stage as to exhibit rust till the weather

again cleared up very opportunely, but it was abundantly evident that, in the event of a continuation of humidity for a few days longer, the woolly-eared would have sustained irreparable injury. Hence it is obvious that, while woolly-eared wheat will, in all probability, yield a good crop in a favourable season, it is, notwithstanding, a risk to cultivate such a variety in a moist and versatile climate.

In point of ripening, the woolly-eared was ready for the sickle on the 25th of August, but the Pearl, Chidham, and Hopetoun were not ready till the 1st of September. From the time of coming into ear, the Hopetoun appeared to lag some three days behind the Pearl and Chidham; and the heat having become intense, these three varieties were all ready, and were cut down at the same time. The red varieties, from the last-named cause, also ripened quickly, and were ready for the sickle on the 4th of the same month.

A continuation of fine weather enabled each variety to be stacked and thatched separately in excellent order.

The final results of the return, after being lately thrashed and dressed, are herewith annexed:—

	Weight per bushel.		Weight of marketable Grain.		Weight of Drawings.	Weight of Straw.
	lb.	oz.	imp. st.	lb.	lb.	imp. st.
Chidham, . .	63	13	84	13½	29½	162
Pearl, . . .	63	7	85	11½	23	161
Danzig-woolly-eared,	59	13	84	8	48½	160
Hopetoun, . .	61	8	93	12½	27½	174
Belgian, new-red, .	60	4	80	5	13½	146
Blood-red, . .	61	7	78	13½	26½	121

From the circumstance of the Blood-red having been thinner on the ground than the other varieties, it sustained more damage from game, and it may be safely calculated that half a bushel of grain was destroyed, from that cause, more than on the other ridges, which were also partially damaged. Portions of the above-named varieties of wheat were sold through a commission agent, and it may be remarked that all the white varieties exhibited fine samples, and a portion of each separately brought 21s. per thirteen imperial stones, at Whitehaven. The two red varieties only brought 18s. 6d. for the same weight. The white found purchasers for seed, and the red for grinding.

In conclusion, my impression is, that Hopetoun or Hunter's, and Chidham are the varieties best adapted for the climate of Wigtonshire, which is mild and moist—the two former as

being most productive in point of yield, and the latter, like the other two, not being apt to lodge, and as producing a finer sample, and consequently more likely to sell for seed in the proper season.

ON THE MODE IN WHICH LIME OPERATES IN RENDERING THE SOIL BETTER ADAPTED FOR THE GERMINATION AND GROWTH OF PARTICULAR PLANTS.

By Robert M'Turk, Esq., of Hastings Hall, Dumfriesshire.

[Premium, the Silver Medal.]

There is no substance, perhaps, so extensively used for agricultural purposes, with regard to whose agency, and the time of applying it to the soil, the opinions of practical men have differed so widely as that of lime; for, while it has been, and, I may say, is at the present time, regarded by one class of agriculturists as a manure, it is by another, and, perhaps, not the worst-informed class, regarded merely as a stimulant; that of itself it contributes almost nothing to the growth of plants, and that the benefit resulting from the application of it to the soil is owing entirely to the action which it exerts upon other bodies which it encounters in the soil. It would not be difficult to shew that lime, like the other earthy bodies, enters so sparingly into the constitution of plants, that its presence, in many whose growth it promotes, can, upon analysis, with difficulty be detected, and we are, therefore, entitled, perhaps, to regard its presence, on some occasions, as accidental rather than as a necessary constituent. Were lime really entitled to be regarded as a manure, we are inclined to think that its effects would be less evident than they really are, especially when we take into consideration the very small proportion in which it is found to exist in those plants which are considered as most worthy of cultivation, and for promoting the growth of which it is most frequently applied. To what, then, are we to attribute the increased fertility of these soils which have received a due proportion of lime? Most certainly not to the influence which it exerts over the earthy bodies which constitute the soil, these being saturated metallic oxides, which have no affinity for it. Nor has lime an affinity for any of the elements which they contain; and, if the soil did not contain other ingredients, upon which it powerfully acts, its application would be followed by no beneficial results. These ingredients are the remains of bodies which have lived and

died, and still, in some degree, retain their organization; and, in proportion to the quantity of decomposable matter which they contain, and the causticity of the lime when applied to them, will be the effect produced. If, then, the action produced by the lime depends so much upon the state in which it is applied, it is also proper that we should mention that its causticity depends, *first*, upon the freeness from other earthy matters, or, in other words, its purity; and, *secondly*, on the time that is allowed to elapse between the burning and the application; the burning being simply the means by which the carbonic acid is expelled, and the lime being thereby changed from a mild to a caustic state, or, as it is called, quick-lime. Water is then applied, for the purpose of slaking or pulverizing it, in order that its distribution over the land may be more equal, and effected with greater facility. But, from the time it is cooled, after it comes from the kiln, its affinity for carbonic acid gas is very strong, and it will continue to attract it from the atmosphere till it is again united to a proportion equal to what was expelled by the operation of burning; and if this is allowed to take place before it is applied to the soil, it returns to a state comparatively inactive, and, in proportion as it has been allowed time, and placed under circumstances favourable for attracting carbonic acid gas, it will lose the power of acting upon, or disorganizing the animal or vegetable remains which it encounters in the soil, and also of neutralizing any acidulous matter which may there exist.

We shall now endeavour to explain the nature of the action which lime exerts upon the organized matter it encounters in the soil, and in what manner this action tends to promote the germination and growth of particular vegetables.

When a plant dies, it leaves its roots in the soil; and the roots of some plants occupy a much larger space than a person unacquainted with their growth may suppose. The softer and more juicy parts begin to rot or to be decomposed—which, in fact, is the loosening of that mysterious influence by which the elements of all organized bodies are held together as long as life endures; and the process of decomposition of any animal or vegetable substance is, therefore, simply the restoring to nature those substances, in their elementary forms, which it at first received from *the soil or atmosphere*—and this process goes on with more or less rapidity according to the nature of the substance, and the circumstances under which it is placed. Although it is a well-established fact that putrefactive fermentation, or the process of decomposition, cannot take place unless in a temperature of above 32° Fahrenheit, a free admission of the atmosphere, and a certain degree of moisture; still these agents are always present in the soil, within a mode-

rate depth from the surface, and under circumstances sufficiently favourable to effect the decomposition of the softer and more juicy parts of animal and vegetable substances; but when their decomposition has taken place, the more solid parts still remain, and these, with the yearly contribution afforded by the more recent plants, constitute an inexhaustible source of organized matter from which, by well-directed skill and industry, man may derive his means of subsistence. In this beautiful provision of nature, we find that, when man commits to the earth the remains of animal or vegetable bodies, he not only secures a present nourishment to crops which supply his own immediate wants, in the more decomposable parts of those remains, but has also laid up a bountiful store for those of his race who will take his place on earth when his labours are over. Lime, then, is an agent which enables us to avail ourselves of the hidden stores of nourishment which the soil contains; for, when it is applied to the soil in its caustic state, it is washed in by showers of rain, and, in its progress through the soil, encounters a portion of inert, insoluble, but decomposable matter, which it acts upon in such a manner as to effect its decomposition, and resolve it into three parts essentially different in their nature and character, all which parts are contained in the smallest portion that can be decomposed—*first*, the gaseous; *second*, the soluble; and, *third*, the residuary matter. It is the two first of these we are to regard as the immediate cause of the increased fitness of the soil for the germination and growth of particular plants.

First, then, with regard to the germination of particular seeds, and there is none with regard to which it is more remarkably the case than that of white clover, and, at the same time, there is no plant more desirable to be obtained. When lime is applied to the surface of pasture land of so inferior quality that clover has not before made its appearance, and, if the land is not so wet as to counteract the influence of the lime in the course of the second year after its application, white clover is almost certain to appear. It is evident from this that the seeds of the clover must have been in the land before it was limed, as the calcination of the lime completely precludes the possibility of the lime itself being the medium through which they had been conveyed. How long the seeds may have lain there, without their vital principle being destroyed, we have no data to form an estimate; but we know they must have been there from a very remote period, and their coat must be of a very impervious nature, to have prevented germination, and to have protected it so long from injury; for germination, like decomposition, requires a certain temperature, and the seed to be in contact with moisture and

the atmosphere; and the rapidity of the process, in these circumstances, depends upon the temperature, so long as it does not exceed 100° of Fahrenheit. When lime, then, commences its action upon decomposable matter, a portion of gas is disengaged, which penetrates the soil above it, and is partly absorbed by the soil, and partly makes its escape to the atmosphere; and, as decomposition proceeds, the soil becomes looser and more permeable to the atmosphere. The temperature is, at the same time, increased by the more ready admission of the sun's rays, while the heat, which is always evolved in the process of putrefaction, stimulates the seed to absorb moisture, and, at the same time, oxygen from the atmosphere, which now finds ready admission through the now permeable soil. The germination of the seed is thus effected which had lain for ages in the soil, and might have continued so for ages to come, had the action of lime on the decomposable matter not rendered the superincumbent soil porous, by which the atmosphere was admitted, and the oxygen, its vivifying principle, absorbed, and the temperature raised by the ready admission of the sun's rays, and the heat evolved during decomposition.

The next point for consideration is the manner in which lime promotes the growth of particular plants. Although the seeds of some plants are covered with a coating so impervious to moisture and the atmosphere as, when buried in the consolidated earth, germination cannot take place without the agency of some powerful stimulant, such as lime, still we are acquainted with no plant of which it does not in some degree promote the growth. It is true that, when applied to land, some of the plants which before occupied the surface disappear, but it is doubtful whether this arises from anything in the lime which is deleterious to such plants, or whether its action has so powerfully promoted the growth of others, that their increased luxuriance proves fatal to those of weaker character; and, if pasture is allowed to become too tall and rank for two or three summers together, the white clover, which indicated the improvement of the land, is choked, and, the action of the lime having subsided, the germination of other seeds of the same plant does not take place.

When gaseous matter is disengaged by the action of lime, the matter to which it has united itself is partially rendered soluble in water; and it is a truth, which requires no illustration, that no substance of any kind can be received as nourishment by plants which has not, in the first instance, been dissolved in water, the mouths of the roots being so very small as not to admit the point of the finest needle. It farther seems to be a law of nature that organized substances cannot again form part of a living being without being in the first

place disorganized; and in proportion to the quantity of the inert matter which the lime has acted upon and rendered soluble, and also in proportion to the gaseous matter which has been evolved during the process, and been absorbed by the soil, will be the amount of nourishment or advantage resulting from the application of lime. Although we have selected clover as the plant, the germination of which frequently follows the use of lime, there are others over which it exerts an equal influence; but as its appearance is the surest indication of an important change having taken place in the soil, whether the lime had been applied to improve the pasturage or to enrich the soil for the cultivation of other crops, the appearance of other plants is often overlooked, and some do not germinate till after the land is ploughed and placed under more favourable circumstances, of which class of plants the dead nettle furnishes a good example.

There is another argument which we may advance, in support of this view of the germination and growth of clover, arising from the influence of draining. Where this improvement has been sufficiently made, so as to effect an amelioration of the soil, white clover is sure to make its appearance. This is owing exactly to the same change in the soil, in consequence of drainage, which we have ascribed to the lime; for, when superabundant moisture is withdrawn, plants of a semi-aquatic nature die, and others, more suited to the altered nature of the soil, take their place, and the atmosphere and sun's rays are permitted to penetrate with facility the space which the water had occupied. The necessary agents for promoting decomposition are then present, and the process first commences among the partially decomposed remains of vegetables which have perhaps died many years before, and it matters not whether their decomposition has been brought about by the action of lime or the influence of draining. Seeds of difficult germination, existing in the soil, are placed under the same favourable circumstances as with lime; for the oxygen absorbed by the seeds during the process converts the farinaceous matter which they contain into sugar, and the roots of the infant plant are supplied with it till it possesses strength to take hold of the soil, and to appropriate to itself a portion of the soluble matter which the process we have described had formed in the soil.

The Marquis of Tweeddale stated, at the Society's meeting at Berwick, that lime seemed to be injurious to crops on land that had been drained. The noble Marquis did not state in what respect the crops were injured in consequence of the lime; but it appeared to us not less evident than if his Lordship had stated it in explicit terms, that the injury could only have arisen from one of two causes, namely, from too violent action excited by the

united influences of draining and liming a soil containing much decomposable matter; and the consequent evolution, too, of much gaseous matter, in its ascent to the surface, had loosened or *heaved* the soil, that the seed was thrown out or the plant rendered so loose as to become incapable of nourishing itself in the slightest drought. This is one way in which lime might prove injurious to drained land; but there is another we have frequently witnessed in the *lodging* of the crop before the ear is filled, from the luxuriance arising from excess of soluble matter, excited by the united agencies of liming and draining.

We shall now mention some of the experiments which we made in the course of the season, which tend to illustrate and confirm the statements here advanced as to the causes of the appearance of white clover when lime is applied. On the 12th May, 1841, we had a piece of land, well dug and cleaned, divided into nine parts, by means of pins driven into the ground, and division-boards nailed to them to keep them firm in their places. The use of the division-boards was not only to divide the portions of ground separately, but also when the ground was levelled within them the exact depth of earth in each division might be measured.

No. 1. Six feet square; the clover-seed sown on the surface.

No. 2. Ditto; the clover-seed raked in gently.

No. 3. Ditto, half an inch of cover.

No. 4. Ditto; six-eighths of cover, one-half of the division compressed by treading, and afterwards smoothed.

No. 5. Ditto; one inch of cover, and the other half compressed.

No. 6. Ditto; one inch and a-quarter of cover, the other half compressed and smoothed.

No. 7. Ditto; one inch and a-half of cover, the other half compressed and smoothed.

No. 8. Ditto; two inches of cover, one-half compressed and smoothed.

No. 9. Ditto; two inches and a-half of cover, one-half compressed and smoothed like the rest.

After the one-half of the divisions, Nos. 4, 5, 6, 7, 8, and 9, were compressed by treading upon them, and smoothing them with the back of a spade, the one-half of each of the nine divisions in the opposite direction received an ordinary liming. The weather, for some time after the 12th, was mild, and sufficiently moist to forward germination. Nos. 1, 2, and 3, were in an active state of germination on the 19th day of the month; No. 4, on the 21st, and the compressed division not till the 25th; No. 5, on the 24th, and the compressed and limed division not till the 1st of June, the other sometime afterwards; No. 6, germinated only

on the limed divisions; the uncompressed about the middle, and towards the end of June; No. 7 exhibited, at this time, no appearance of clover, and afterwards a few plants appeared on the limed divisions, some time after the removal of the weeds which had germinated upon it; and this operation, no doubt, promoted both the action of the lime and the germination of the seeds, by allowing the air more ready access to those parts from which the roots had been extracted; and also, not improbably, by bringing some of the clover-seeds nearer the surface. On Nos. 8 and 9 we had no clover-plants in the course of the season. On Nos. 1, 2, 3, and 4, we could observe no difference on account of the lime, though applied in a hot or caustic state; and the reason we conceive why it had no influence on these divisions was, because they were placed under circumstances so favourable to germination that it was effected before the action of the lime commenced; and that on Nos. 5, 6, and 7, which were under circumstances less favourable, the germination did not take place till stimulated by the action of the lime; and whether it will have any influence on Nos. 8 and 9, next summer will shew.

The practical inference we would draw from these experiments, in the first place, is this—Is the present system of sowing clover calculated to promote germination? We have no hesitation in saying that it is precisely the reverse; for, when sown with rye-grass seed, and harrowed in, in the usual way, it cannot fail to be too deeply covered, and the consequence of the rolling, which is now a general practice, must also increase the evil. It is, perhaps, from this cause that we always see the best braird of clover on the hard and gravelly parts of the field, and we therefore conclude that that is the land best suited for its growth, when, in fact, we are inclined to think that, under the present system of sowing, harrowing, and rolling, that it is only the best adapted for the germination of the seed from its more permeable nature. It might be worthy of investigation to ascertain how far the present system of management will account for the falling off of the crops of red clover, which has been experienced for some years back; for the germination of the seed of this plant requires circumstances not less favourable than that of the white. To ascertain this point, it would only require to be sown by itself, after the rye-grass is harrowed in, and might be tried either with or without rolling.

There is another practical application that may also be drawn from the view we have advanced regarding the action of lime upon decomposable matter. We have imputed to this action nearly the whole benefit resulting to the crop from its application. If this view is well founded, it must follow that its application to land which naturally contains but little, or which has been

exhausted of its decomposable matter by overcropping, or otherwise, (for much ploughing, by exposing the soil to the action of the atmosphere, also tends to decompose animal or vegetable matter, and the crops to exhaust it,) can be attended with little or no advantage, and it is from this cause that the first application of lime is always attended with the best effect from the undiminished accumulation of this matter in the soil. The application of dung or any other manure to the soil, to use a familiar illustration, is like giving a feed of corn to a horse—it tends to strengthen and nourish; while lime may be regarded as the application of the whip or spur—it imparts no new strength, but stimulates into action the power which previously existed.

ON THE WOOLLEN MANUFACTURES OBTAINED FROM THE WOOL OF OUR MOUNTAIN SHEEP.

By Mr Robert Boyd, Innerleithen. Peeblesshire.

From the numerous rivers and mountain streams which traverse our pastoral districts, no country possesses greater facilities for washing sheep than Scotland, yet it is too true that sheep-washing is more imperfectly performed than any other department of sheep husbandry. In consequence of this negligence, it is well known to manufacturers that Scotch high-land wool suffers a reduction in scouring of one-half, and, when it is smeared with tar and butter, I have frequently found the reduction amount to five-eighths. English wool-staplers are the purchasers of Scotch wool, and, so long as it will continue to be so very imperfectly managed, the amount annually paid for its transport to England will constitute a considerable proportion of its intrinsic value, independent of the expense attending the *waste* which wool of such description incurs in scouring, drying, &c., before it can be manufactured into any description of goods, and which bears an almost incredible proportion of the original cost. Add to these the great inconvenience attending the drying, in winter and spring, of wool that requires so much scouring. After these remarks, we need not wonder at hearing the English wool-stapler talk disparagingly of Scotch wool. Farmers complain that the small prices obtained for Scotch wool holds out no inducement to handle their fleeces better, but I can tell them that, when we view the nature and properties of foreign wool, and when, in particular, the perfect condition in which it is sent to market is taken into consideration, the Scotch wool stands a higher price to the manufacturers than the foreign; in proof of which averment I may

state a fact consistent with my own knowledge, that from foreign wool at one shilling a-pound a cloth (when the felting properties are required) can be produced that will fetch more money per yard than if made from Scotch wool at one shilling and threepence per pound. Were the comparative merits of Scotch and foreign wool, in so far as the profit of the manufacturer is concerned, stated, it would be more calculated to astonish than amuse either landlords or tenants. It is therefore to be hoped that both will endeavour to adopt means to improve the management of wool.

Until the year 1825 it was a rare occurrence for the manufacturers of Galashiels, Hawick, Stirling, or Clackmannanshire, to use a single fleece of foreign wool. Since then the consumpt of foreign wool has rapidly increased to the diminution of Scotch. At Galashiels, in particular, the Scotch wool used during a year scarcely amounts to a twentieth part of foreign. It would be unjust to the farmers to attribute this great falling off at Galashiels entirely to the slovenly condition in which Scotch wool is produced, although, beyond all doubt, it has had that effect to no inconsiderable extent. The great cause, however, of this falling off is owing to the Scotch wool not possessing the properties required for producing the goods now generally fabricated, a large proportion of which are of the finest description; and, as the largest profits are derived from the finest description of goods, we need not wonder that capital should as naturally seek profitable investment as water its level.

At Hawick and other places, on the other hand, a considerable quantity of Scotch wool is still used in the manufacturing of hosiery yarns, blankets, and carpets, for which the material is well adapted. Hosiery yarns, however, produced from the coarsest parts of the fleece, produce no *direct* profit to the manufacturer. So long as he is in the trade he must make the lower class of yarns, in order to meet the demands of purchasers of the finer description, upon which there is profit; and unless he can supply all the various qualities required, he might not be able to dispose of his finer qualities; and this state of trade is frequently very annoying, as the lower descriptions of yarn often constitute the greater proportion of the orders received. In consequence of this annoyance, many manufacturers have of late relinquished the hosiery yarn trade, and have become makers of tartans and Tweeds, which are not only more profitable, but the demand for them comes from a superior class of people.

I have already stated that the English manufacturers are our best customers, and there is no doubt that they would increase their purchases could the wool-growers be induced to produce fleeces in a more perfect state than is the case; because of the

great variety of purposes into which Scotch wool is fabricated in England, and for which it is much better adapted than any of the foreign.

I have no hesitation in stating that the demand will continue to equal the supply; and in this opinion I am supported by the concurrent testimony of not a few of the most extensive wool-dealers in England, many of whom are men who have the best opportunity of acquiring the correctest information on the subject. To support this demand, however, very much depends upon the wool-growers themselves. Their object should be to find out the description of stock which best suits the market, and, of course, yields the greatest return. No storemaster, however, will venture on a general and radical change of his stock until he has once ascertained that the qualities of the pasture will co-operate with him in the experiment. This quality, and the altitude of the range, ought to determine what description of stock should be kept. The taste as well as the constitution of the modern pure Cheviot are more delicate than those of the ancient breed, and their relish for alpine pasture being, in a great measure, lost, large tracts of elevated pasture, abounding with the coarser grasses, are now almost deserted by the pure Cheviot. It will be readily admitted that the *well-clad* Cheviot sheep are decidedly the most profitable for our Scotch mountains. At the same time it is proper to observe that sheep are not to be considered valuable in regard to their fleeces alone; because they merit attention, as furnishing food as well as clothing to man—and any particular breed is of value only in as far as these important objects are combined.

Every shepherd of our mountains must have seen it proved again and again to his satisfaction how much better adapted a well-clad sheep is for braving the storms of a protracted winter than one scantily clad; and, as a consequence of thus being better protected, there will be less mortality among them than amongst those to whom nature has been less bountiful in providing with good winter covering. They will also be in better condition in spring; and it is an ascertained fact that the good condition of the ewe tends, in a great degree, to secure a successful lambing season. How much better, too, is the ewe with the lofty-grown fleece enabled to protect her young from the storm than one which is, comparatively speaking, bare or naked. The Cheviot, which produces a weighty or lofty-grown fleece, when fed off, produces also a greater weight of mutton than the purer or finer description. A considerable portion of their heavier fleece is applicable to combing purposes, so that the well-clad sheep has, for the last ten or fifteen years, yielded the greater profit.

ON THE EXTENDED APPLICATION OF THE STEAM-ENGINE, OR OTHER IMPELLING POWER OF THE THRASHING-MACHINE, TO FARM PURPOSES; *being Extracts from an Essay on this Subject.**

By Robert Ritchie, Esq., F.R.S.S.A., &c., Civil Engineer, Edinburgh.

[Premium, Ten Sovereigns.]

The rapid advancement which Great Britain has made by the influence of her steam-power and machinery in manufactures, commerce, and navigation, has not been without a corresponding effect, though perhaps not to the same extent, in agriculture. The proof of this is visible in the strenuous exertions made by agriculturists, of late years, to avail themselves of the use of machinery and improved implements of husbandry to economize labour. With the power of the steam-engine at command—although not now, perhaps, to the extent it may ultimately be made available—the British farmer has it in his power, at a moderate expense, on almost every farm, to lessen the labour of the barn, to extend its application to various useful purposes, and to place farm economics in a position of advancement which they have not hitherto attained. . . . .

By far the greater portion of the thrashing-mills erected in the agricultural districts of Scotland are propelled by horse-power; but however convenient the use of the horse-walk and fixed thrashing-machine was to the farmer, and justly considered, when introduced, as a great improvement in barn operations, and is yet esteemed so, still it has not been without its inconveniences; but, when contrasted with the laborious employment of the flail, yet so generally in use throughout the world, its greater expedition and efficiency become apparent; and, when we consider that the use of the flail was better than the feet of animals, we may be enabled to form some idea of the value of the horse-mill to farm purposes. Still, of later years, the intelligent farmer has hailed, with much satisfaction, the application of a new impelling power to the thrashing-machine—a power whose dominion extends over every branch of the arts and manufactures of our country—which has given an impulse to modern nations, a command over the produce of every climate, and of which the most learned nations of antiquity never could surmise.

The application of steam-power to farm purposes seems by far the most important improvement which has been made, connected

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* The author, by permission of the Directors of the Society, intends shortly to publish this Essay entire, with drawings fully explanatory of the different kinds of engines used on farms, mode of attachment to old mills, and connected with subordinate machines; with a historical sketch.—Ed.

with agriculture, in these times, and must, from its obvious advantages, soon supersede every other power, except, perhaps, in a few isolated situations, where an ample water-power can be obtained, or where the smallness of the farms make it unimportant.

It is a good many years since steam-power was first applied to farms in Scotland, and, in the borders of England, in some few instances, from twenty to perhaps thirty years; but it is only within the last ten or fifteen years that it has become general, if it can even be said to be yet in general use.

The advantages of the steam-engine over wind, as the impelling power to the thrashing-machine, appear to be, that it is always at command, and ready to perform the work required by day or night. Its advantages over water-power are, that neither heat can dry it up nor cold freeze it. Its advantages over horse-power are, that the motion is more regular and the work must be better done; for horses, in the thrashing-mill, generally pull unequally, while the strain upon the limbs, in this severe work, proves injurious to them. When the farmer, too, has always his horses fresh and ready for the field, he can do more work with fewer horses;* and if a pair or more can be saved, it is an important item to him.

One manifest advantage of steam, as the first mover of machinery, arises from its rapidity and certainty. If the farmer, therefore, can bring his grain on the shortest notice into market—if he can either thrash one stack or a dozen without stoppage, and so avail himself of any sudden rise in the market, without delaying or retarding the other operations of the farm—he possesses advantages invaluable, though no other were attained—advantages which no other means of thrashing can give him. But steam-power likewise possesses that steadiness of action which cannot be obtained whilst employing the horse, and a much greater quantity of corn can be thrashed in a day. The usual quantity of corn thrashed by a six-horse steam-power, is at the rate of five quarters per hour, but four quarters may be taken as the general quantity to thrash easily; however, the quantity must vary according to the grain and straw. If the average of horse-power, as generally driven, be taken at thirty quarters per diem, the average of steam-power may be taken at fifty quarters, giving an advantage of twenty quarters in favour of steam-power, while the latter is kept up at no other expense save fuel of the cheapest description—culm or dross is generally used—and, unlike the horse, when not working, *costs nothing!*

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* The saving of a pair of horses to the farmer has been estimated at fully £100 per annum. Some farmers tell me, who have steam-power, that they can save a pair of horses out of four, on large farms.

hence, in every point of view, the use of steam-power on farms must prove advantageous.

The author of the excellent treatise on Agriculture in the last edition of the *Encyclopædia Britannica*, seems to have fallen into an error when he says, "Wind and steam-power require too much expense for most farms, and that the use of steam must be confined for the most part to coal districts." From the recent date this article has been published, this opinion might not have been expected, if referring to the agricultural districts of Scotland. It may be presumed therefore the opinion has been inadvertently given, and if the author had entered more fully into the consideration of steam as a motive power, he would certainly not have classed it with wind-power. Indeed the rapid extension of steam-power to farms speaks volumes in its behalf. He would have found on investigation the immense benefit of the application of the steam-engine at a *very moderate expense to the farm*. A power which only requires to be understood to be more appreciated, and what almost every farmer who has used it has found to be one of the most advantageous improvements he has made on his farm stead; and, while it increased his comfort, it was attended with no difficulty in the management, requiring no other attention than what any farm servant could easily give.

This power indeed, as applied to agriculture, is yet in infancy; but with a prospect of gigantic manhood before it, it seems fitted in all probability, as it becomes more extended in its range of application, to change the entire face of the country, and give the same impetus to agriculture which it has done to all branches of the arts. No well-informed farmer should be insensible to the value and utility of the steam-engine, even limited as it now is as a moving power to the thrashing machine, and the adoption of this power by him, in most instances, in the best agricultural districts of Scotland and borders of England, evince, beyond a doubt, that it, in his opinion, is the best and most advantageous power which has been yet applied, wherever there are not insuperable obstacles intervening; and it shews how readily the interprising farmer avails himself of whatever improvement enables him to support competition and improve the capabilities of his farm.

In England, *fixed* thrashing-machines have not been much used for farm steads, hence stationary steam-power mills are rarely to be met with. This may arise from a variety of causes without the value of these being overlooked by the various public spirited agricultural associations scattered over the south. It cannot however be supposed, as its advantages become better known and understood, that the application of steam-power to farms, both in England and Ireland, will not in time become as common as in

Scotland, where it has extended with amazing rapidity.* The thrashing of grain with machines in England is generally carried on with portable mills wrought by horses; the thrashing of grain being in some counties a regular branch of trade, the thrasher removing his machine from farm to farm. Recently, steam-power has been strongly recommended at agricultural meetings (at the late show at Derby and other parts) for this purpose, and is now getting into use. The Disc Engine Company of Birmingham have invented a very compact portable engine, boiler, and thrashing-machine, on a carriage. The whole machine provides for its being readily moved to different farms. Mr A. Deans of Birmingham has also made, for a similar purpose, several forms of portable cylinder and piston engines, some with upright and some with horizontal cylinders. These engines are of different powers, from four to six horses', and the engine is placed on a neat iron carriage. The whole occupying very little room, requiring no chimney-stalk or brickwork, and is drawn from place to place by one or two horses. It may be worked, he states, in the field or anywhere, without any fixing, for thrashing corn, cutting chaff, and other agricultural purposes. Mr Dean's inventions are clever, and many of them will be found useful. His portable steam-engine, with patent irrigator and fire-engine combined, adapted at the same time for driving thrashing-machines, pumping and draining, is deserving of the attention of the farmer. These applications are all very suitable for small farms, and dispense with the laborious employment of the flail. But the advantages of a fixed thrashing-machine, and steady and cheap motive power, under the command of the farmer at all times, are so palpably apparent, that the only wonder can be how the farmer of land, to any reasonable extent, can do without it, as the want of it must place him under many disadvantages.

In the following remarks, respecting the subordinate purposes to which the prime or impelling power can be advantageously extended at the farm, the observations shall be confined to steam-power, although it will be easily understood that many additional uses to which this power can be applied may equally well suit any impelling agent of machinery in which there is a surplus power.

Before entering on this subject, it may be proper shortly to describe the form generally adopted, and give an example.†

* The Report on the Advantages of Steam as a Motive Power on Roads by the House of Commons, is strangely coincident in the same reasoning.

† In the following remarks it is barely possible to be intelligible without sketches of the drawings which accompanied this essay, except by those who are conversant with Scotch farm-steads; but as the paper and drawings will be subsequently published, reference can be made to the book.

In most of the new onsteads, where steam-power is used, the engine-house is generally an outshot from the barn. The boiler of the steam-engine is supplied from a well sunk at one side of the engine-room. This is the general plan with stationary farm-engines, and the back or surplus water from the boiler is returned to the well, the water being usually moderately heated before entering the boiler. But when well-water cannot be obtained, which often happens in coal districts, a pipe is led to a cistern, from the nearest pond, from which the engine pumps the water directly into the boiler; or the engine may be made to pump the water from the pond at a moderate distance; but this is just taking so much power from the engine itself. It is desirable always that the pump throws up an ample supply of water, when high-pressure engines are used, to prevent, from negligence, the risk of overheating and burning the sides of the boiler; of course, with condensing engines a much more abundant supply of water is indispensably necessary, hence the non-condensing engine has been in many cases adopted, from the smaller quantity of water it requires. The engine, about seven horse-power, is on the non-condensing principle, with over-head crank; and the attachment of the power to the mill is extremely simple. The thrashing-mill itself possesses every modern improvement. There are elevators to lift the grain to the hand-fanners, and elevators to repass the refuse through the mill; both of which are likewise worked by the engine-power; likewise a corn and bean bruiser, which admits of being attached or detached at pleasure. The steam-engine has been several years in use, and is most perfect of its kind, (it was made under my own direction,) and is capable of driving easily the thrashing-machine and machinery connected with it, and also any additional machines which the farmer may find for his advantage to attach to it.

Another example is given, shewing the connection of the steam-engine with a very complete set of farm-offices. This is entirely new, and would easily admit of subordinate machinery, if desired. This steam-engine is also of high-pressure or non-condensing, excellent of its class, and capable, as it ought to be, of doing more than the work required of it. The neatest arrangement, however, of the steam-engine-house and boiler, is when these buildings form a part of the range itself of the farm-buildings, and not an outshot from it.

But, in truth, there is no end to the different plans which could be adopted by a skilful farm-architect or farm-engineer; and it may be said every farm-stead requires a separate design to suit the locality and wants of the farmer. There are no parts of Scotland where so many snug, compact farm-buildings can be seen as in the neighbourhood of Edinburgh, the accommodation

is ample, without being superfluous. So rapid, indeed, has been the extension of steam-power to farms in this vicinity, that, from the fine elevations round Edinburgh, more than 100 steam-engine stalks or chimneys may be observed as the landmarks of the farm, and giving a peculiar feature to the landscape.

Although the subordinate purposes to which the impelling powers of the thrashing-machine have as yet been extremely limited, yet it admits of no doubt, if under proper control, it may be applied to a variety of useful purposes to which it has not as yet been applied, beside that of thrashing grain. It is, therefore, of importance to consider the most simple and economical way in which the subordinate machines can be connected with the impelling power.

To the bruising of grain the power is commonly applied, and that most advantageously to the farmer. It has also been applied to chopping of hay, slicing of turnips, grinding of rape-cake, working a butter-churn, and driving circular-saws; to these, and perhaps many other purposes, the first power has already been at different farms applied. An inconvenience, however, arises—although, perhaps, of no very great importance—when the smaller machines are used, that they cannot be driven except when the thrashing-mill shaft is set in motion, as the axle or shaft of the steam-engine connects the first power with the mill, and, if worked with belts, from a separate shaft; this latter shaft cannot be set in motion until the main engine-shaft, which connects engine and thrashing-machine, is going. When subordinate machines are used, worked by steam-power, they should be so contrived that the mill* may either be worked at the same time, or taken out of gear, and the machines worked or driven independently of the mill. This may be attended, perhaps, with more expense in the first erection, but it is more complete, and will, on most occasions when used, save a loss of much steam.

Several examples might be adduced in explication of these points. At one of the first steam-powers, for a large farm, put up in West Lothian, the steam-engine can either drive the thrashing-mill in conjunction with grinding-mills for meal and flour, or the latter can be used by themselves. The machinery can be detached or taken out of gear at pleasure, and the whole is of the most perfect description. In such a case as this, the steam-power must be ample, which it is in the instance alluded to.

In another example of a simple description, in Mid-Lothian, an engine of eight horse-power, non-condensing, is regularly in use for a saw-mill, while, at the same time, it is the motive

* The word mill is used indiscriminately for thrashing-machine.

power of the thrashing-machine. The force is communicated to the saw-mill by means of a large cogged wheel placed on the main shaft, between the fly-wheel and engine itself, driving two circular saws. The power is taken from, or given to, either thrashing-machine or saw-mill at pleasure, by means of pinions or small wheels. Cut wood is manufactured here to a considerable extent, which shews how easily the steam-power can be advantageously employed, and to do also the work of the thrashing-machine.

It would be tedious to go over the various skilful applications which have already been made use of by enterprising farmers in the agricultural counties round Edinburgh. The subject is *new*, and, perhaps, but in infancy. Of course a great deal remains to be done by skill and ingenuity before such plans are extensively adopted; but I have little doubt as the value of steam, as before stated, becomes fully known, as the *best* PROPELLING POWER FOR THE FARMER, endless may be the applications of it even to farm purposes.

One of the best examples I have yet met with of the acknowledged utility of subordinate machines worked or driven by the first power, is at a fine farm in East Lothian. The steam-engine which drives the thrashing-machine is a neat condensing engine, but only of six-horse power. In addition to working elevators and dressing fanners connected with a complete thrashing-machine, a shaft or axle—taking the power directly from the main-shaft of the mill—is led through the barn, which, by means of drums and belts, is made to work a corn-bruiser, barley-hummeller, and fanners, and likewise a pair of stones for a flour mill, and a mill for grinding rape cake; and, by an additional shaft, a circular saw. The whole of the machines are so arranged that they can be driven alternately, and the flour stones are let off to a neighbouring miller, thus proving the economy of the arrangement. In addition to these machines, the spare steam from the boiler is made to heat a *drying loft*, which is placed over the boiler shed, on the floor of which, small tin or iron pipes are laid, heated by steam from the boiler. These pipes are protected by a grating of wood, and the whole covered with hair-cloth. Damp grain is here dried with the greatest facility; and in wet seasons the drying closet or room is found to be of great utility.

Indeed the whole arrangement at the farm displays much skill and ingenuity; and we could not have a better example of a *small power* with which so many subordinate machines can be usefully employed without great trouble or expense.

I might give several more illustrations from *other farms* where great ingenuity has been displayed in economizing labour by machinery, but I think it unnecessary, as the one I have given

is amongst the best instances I have met with, where the advantages of such means were duly appreciated and early adopted. However, it may be said that, in general, the impelling power is *strictly confined* to driving the thrashing-machine and connections of it. Indeed, unless the steam-engine has ample power, it would be useless attempting to work more than the mill at one time; but we see, if the power is judiciously arranged, that even a steam-engine of *only* six-horse power can be made of powerful avail to the farmer.

It seems singular that the farmer of the present day does not turn more attention to these useful applications of ingenuity so advantageous to himself, of which I have given so striking an example; for, when we turn to the century that is past, which we are so apt to deride for its want of mechanical contrivances, and think so much behind the present age, we shall find much to admire if we have the patience to investigate. If we turn to the works of Dr Stephen Hales, F.R.S., and other writers, farmers will find much curious and useful information. His plan of keeping corn sweet in sacks was considered of great benefit to farmers. A hollow reed or cane, perforated with 200 holes, was placed in the sack, and the nose of a common kitchen bellows placed into a wooden faucet attached to a leathern pipe ten inches long, distended by a spiral wire fixed to the top of the stick. Each stroke of the bellows would discharge a quart of air, sixty-four strokes per minute would convey a quantity of air equal to the capacity of a four bushel sack. With the steam-power at command at the farm to drive a blowing fan, such a scheme as this could be easily adopted by the farmer, and still exceed the plan of preserving corn by ventilation, which was much thought of at the time, although ventilators of a much simpler construction can now be readily applied for the purpose. It is stated (in the *Gentlemen's Magazine*, 1749) that the ventilators contrived by Dr Hales for preserving corn were so much esteemed in France, that M. de Humel de Monceau, a Member of the Royal Academy of Sciences, preserved a large heap of corn free from weevils for two years, without turning it, merely by *blowing air up through it*. He likewise procured a large granary to preserve, in the same manner, with ventilators worked by a windmill, quantities of corn, with a view of making it a general practice in France. Dr Hales also applied his ventilators very usefully for sweeting milk when ill-tasted, also for water, by blowing showers of air through it. His ventilators in dairies would be found advantageous. If such was the knowledge of these matters in the last century, it seems singular how little has been really done to follow out the experience they acquired; yet it is not less curious to observe the coin-

cidence that so often happens between past and present inventions; for the plan I have described, as applied for drying grain in East Lothian, is a counterpart of the very plan recommended by Dr Hales for drying malt, hops, &c., only the latter had the advantage in recommending blowing fresh air upwards through wooden bars, "*or large laths, nailed to the floor, and hair-cloth to be laid on them.*"

While, therefore, improving the present inventions, do not let us overlook the past, and claim, as new ideas and inventions, what may have been known and applied centuries before. Let the information and appliances of the past be acknowledged as so much experience gained, and incorporated with the superior advantages in mechanical construction of the present times.

In applying the steam-engine power to subordinate purposes, and mixed machinery at new farm offices, there is more scope for the exercise of skill and judicious arrangement on the part of the farm architect and engineer than when steam is made use of at old farm buildings. The method of connecting the first power to the machines, likewise admits of difference of opinion. It is sometimes done by belts and sometimes by cogged and bevelled wheels. Although there is more friction by wheels, they are generally preferred by engineers, as belts are apt to slip, and cannot be durable, instances being found, where in places in barns, or places infested with rats, they are even destroyed by these vermin. All main shafts or axles are invariably preferred to be connected with wheels, and likewise in connecting subsidiary or minor shafts to the first mover, wheels are made use of, although, in many instances, belts must be had recourse to, and, by having several shafts to lock and unlock to the main crank shaft, or to go easily in or out of gear, a variety of useful machines may be driven by steam-power at every farm at which steam is made use of.

At new farm buildings, in addition to driving the thrashing-machine, the whole array of the minor implements or machines of the barn, and machines for preparing food for cattle and horses, machines for working the dairy utensils, machines for preparing artificial manures, machines for pumping or irrigation, by means of hose, machines for preparing grain for food, and machines for giving warmth and ventilation, might all be attainable, and easily made applicable at every farm, by means of steam-power.

Although such machinery may at first view appear *complicated*, yet in *reality* it *is not so*, and might be made of very easy management. I need not enter into any minute description of the methods of applying such subordinate machines as may be thus adopted. The details must be left to individual skill to execute. It is sufficient here that I suggest and point out the practica-

bility of easily following out the suggestions made. With this view, the germ of such an arrangement of subordinate machines, applicable to the various purposes above noticed, I shall briefly describe.

A steam-engine of ample power (suppose six, or eight, or ten horse power, for farms varying from 250 acres and upwards) is erected, in the first instance, to drive the thrashing-machine, and is supposed to be in daily use, as the *extended* applications of steam-power *implies that the* farmer will find it to his advantage to make use of the engine almost constantly, or, at all events, in winter, to have the fire on the boiler. To be of real utility, the power must be generally available or at command, at least more frequently in use than *presently* done, where the engine and boiler remain a dead-letter except when thrashing is going forward; and where the refuse of coal or culm can be readily obtained, as in coal districts, there can be little apology wanted for not having the boiler regularly in use, which should be constructed on the most economical principles as regards fuel. The construction of the boiler is of most paramount importance in farm engines, both as regards economy and safety. We have seen what has been done in locomotive engines, by industry and economy in fuel, shewn fully in Mr Macneil's evidence before the House of Commons in 1832. The evidence of Mr Macneil in convincing the committee that experience will soon teach a better construction of the engines, and a less costly make, and generally a requisite supply of steam. When the steam-engine was not required for the purposes of the barn, it might, perhaps, in many farms, be advantageously employed for the purposes of pumping and irrigation. Supposing the engine, therefore, to be nearly in daily use, and having every modern improvement, and the thrashing-machine, of similarly improved construction, with elevators, hummeller, corn and bean bruiser, &c., &c. By a direct shaft from the steam-engine, with the power of attaching or detaching, taking in or out of gear at pleasure, meal or flour mill stones are applied, these, if inconvenient, to be worked by the farmer, or, if the corn-mill divides his attention too much, I have given an example where the spare power of the engine was let off to a neighbouring miller. In several instances, however, I have met with farmers who advantageously made use of flour, barley, or meal mills at their farms, and if not used for grinding, a pair of stones would be found of great advantage for bruising grain, and several have been applied for this purpose in the south of Scotland and in Northumberland, at large farms, as much more powerful than the common corn-bruising rollers. From the same shaft a rape-mill, an oil-cake crusher, or even a malt roller could be easily applied, and a circular saw be

driven, and, if thought requisite, a bone-mill could likewise be wrought by the same shaft, and in many farms found useful for "converting ashes, and a variety of otherwise useless rubbish, into fertilizers." Another shaft passing through the straw barn could easily work a straw and hay cutting machine, and also a turnip and potato slicer. The former could be conveniently placed in the stable court (at no great expense a hay loft might be made above the straw barn) and the latter could be placed very conveniently near the cattle court, at the turnip court, or, if preferred, the straw-cutter could be advantageously placed there, instead of the turnip slicer, as these are found so useful in the field.

Other minor machines could easily be driven from these two shafts as they pass through the respective barns. Such as a butter churn for dairy purposes. I have not dwelt much on machinery for dairy purposes, because dairy farms, on a large scale, are rarely combined with grain farms. However, as every farmer is more or less connected with feeding cattle and making butter and cheese, it must be obvious that the command of steam-power gives many advantages, and points out how the female department of the household can be saved much useless labour, and their attention turned to more profitable purposes. Thus the labour of churning by the churning-machine worked by steam-power will enable a great deal more work to be done in much less time.

In addition to the machines I have noticed at the general farm, I may mention that a very simple contrivance might construct a *tram*-way and waggon to the thrashing loft, by which the engine could be made to *draw up* the grain to supply the thrashing-mill, and *return down* the empty waggon, saving much manual labour. Elevators for grain could also easily be constructed to *lift up the grain* to the granary, and lower *it down* upon the carts, wrought by the steam-engine.

The above are a few out of many practicable purposes to which mechanical science may be made to economize human labour, and render the exertions of the *farmer* more advantageous to himself. But a new element is mixed up with the applications of the steam-engine to farms, which, in another point of view, gives it still greater advantages, and these of a practical kind. I allude to the use *which can be made* of the *steam itself*.

A steaming apparatus is a necessary appendage to every farm of a moderate size, and its utility is very generally appreciated. The steam is commonly raised by a separate boiler, but very little skill would be required in applying the steam from the engine boiler to a complete steaming apparatus for cattle. The objections of the steam not being in constant use I have already

alluded to. Where indeed the farmer is *resolved* merely to confine his steam-engine to thrashing of grain, of course a portable steam-power would not apply—it would be inexpedient perhaps to draw steam from his engine boiler, or even put water for boiling turnips in wintering cattle. But the time will soon be past when the farmer will cease to be told, "What a pity it is you cannot make use of your steam-power, except merely for thrashing, after going to so much expense for its erection—it is thus useless to you (keeping it idle) two thirds of the year." As I have said, a test for the ingenuity of the farmer is to be shewn, and he will be judged of as the cleverest and most practical farmer whose skill has brought out the most numerous useful applications. Hence, in this light, steam-power is to be judged of not merely as a *motive power*—which water can as cheaply perform, or which, some day, electro-magnetism* may, perhaps, as cheaply effect—but as possessing advantages *per se*, which I shall attempt shortly to point out. The boiler of the engine, which ought to be no longer than really required to give *steam enough* to prevent waste of fuel in winter, must be daily regularly heated, and then either steam from it, or hot water, as may be required, is to be obtained for preparing food for cattle. It is likewise to be made equally available for stable use. The advantages of having hot water *at all times* in stables is appreciated by every gentleman who takes an interest in his stud.† The spare steam can be made easily to heat a complete range of cottages for farm servants, which may be situated in connection with the farm offices as not to be inconvenient.

We have already seen the facility by which the spare steam was made use of, at a very small expense, to heat a drying loft; even the heat of the boiler itself might be of utility for damp grain placed above the boiler shed, as is frequently done for drying-houses of manufactories. The utility of this plan must not be overlooked in making arrangements for using steam-heat, nor likewise the simplicity by which the same agent could be applied for a clothes'-drying house for family use. Nor must we forget the advantages of heating poultry-houses with spare steam-

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* Although there is little prospect at present of electro-magnetism being brought into use in this country as a moving power of machinery, yet it is stated it has already been brought to considerable advancement on the Continent—and the very ingenious applications of this powerful agent by Mr Daniels and others, holds out a decided prospect of its more extended applications. A very clever model of a machine, driven by electro-magnetism, was shewn at one of the Highland and Agricultural Society's monthly meetings, by Dr Aiton of Dolphington, and an interesting account read by him of the application of electro-magnetism to machinery.

† In some stables the whole range of sleeping-lofts or apartments for the grooms were heated, under my directions, by hot-water pipes or steam; likewise water tanks, or cisterns for the stalls, were heated by hot pipes passing through them.

heat, or even the poussiniere, or nursery for egg-hatching. Nor is this chimerical—the poussiniere of M. Bonnemain, invented fifty years ago, heated by hot-water pipes, or steam, we are told, was found to be an ingenious and profitable establishment; and this plan, as old as the Egyptians, while it has been revived within these few years, affords to the busy housewife, where her spouse has laid out a few pounds on the erection of a steam-engine, or steam-mill as it is called, or boiler, an ample supply of heat for bringing chickens in winter into market, to reward her with a profitable investment. The above are merely a few things of the many this powerful agent can be made to do, even on a small scale; nor must I forget, for the housewife, the washing-machine, both *driven* by steam-power, and *supplied* with steam, and other excellent applications of steam, many of which will be found described (as they have been practically applied) in Silvester's Domestic Philosophy.

The great distance to which steam can be conveyed from the boiler would excite surprise to those who have never seen it; hence there could be no difficulty in applying it, in addition to what is stated, to many horticultural purposes, such as warming a hot-house and conservatory, and pine or melon pits, or even forcing land, or garden ground. The daily new inventions and purposes to which it is applied point out an inexhaustible field for extension.

But the utility of the steam-engine is not practically exhausted; the boiler chimney could be made of the greatest utility for an important purpose—*ventilation*—a thing so much neglected in most arrangements. The whole range of stables, cattle-sheds, and even piggery, grain lofts, &c., could be brought under a perfect system of ventilation by the fire draught, by means of metal or wooden pipes, or brick or stone flues, communicating with the ash-pit of the furnace—a plan which has been long known* yet so little practically made available. The importance of ventilation to stables, though generally admitted, is frequently neglected. Although we have many examples on record, especially in horse-barracks in the army, of the evil consequences of bad ventilation—as all animals, when confined, rapidly destroy the atmosphere, both by respiration and secretitious exhalations from the skin—producing carbonic acid, and other ammoniacal and mephitic gases. Hence the lower animals require *even more air* in the same ratio than the human race; and to keep horses, cattle, poultry, sheep, pigs, and dogs in a healthy condition, and free

* See an account of this, in a paper read by me, before the Royal Society of Arts, 10th April, 1843; and printed in the Society's Transactions.

from cutaneous diseases, when much confined, beside wholesome food, a constant renovation of the air should go on; and even in stables, if heat is required, which it must be, it is surely better to provide artificial heat, by passing a steam-pipe through the stable, than by inclosing the animals in a loose box heated by their own exhalations, or by closing the stable up, to allow them, as it is termed, to draw heat from one another. I do not think sufficient attention is ever paid, in the construction of stables and cattle-houses, to the necessity of ample *light* as well as *air*. The effect of want of light on vegetables and plants is so well known that there can be no doubt light is equally required for the health of man and the lower animals. In addition to the stables, &c., the same range of cottages which I have shewn could be so easily heated with spare steam, or hot water, from the engine-boiler—could, with equal effect, be ventilated by flues drawing or sucking out the impure air to the furnace—or if the fire draught was found inconvenient, or thought objectionable, as has been said, for "attenuating the air," then the wind fan could be driven by the steam-engine, to effect the same purpose. In all and every case to which ventilation is applied, whether to suck out the impure air from cottage or stable, provision is to be made for the inlet of fresh air, as well as the escape of impure air. Thus, with a little expense in the first arrangement, farm-house, cottages, and offices, could be placed under a thorough system of ventilation, under perfect control, and the same agent which effected this would supply, without more cost for fuel, an ample supply of heat to warm with salubrity many cottages; even ample supplies of warm air, if preferred, heated by steam, might be distributed, thereby increasing the comfort of the cottage fire or the farmer's hall.

In addition to all this, an agent so accessible as the engine chimney might be applied to other useful purposes—to preserve the roof and timbers of the buildings, as well as so contrived that a flue from each stack in the yard might create a circulation of air in wet weather, and prevent the heating of the grain in the stack.

I might pursue this subject still farther, but I am well aware that even much of what I have already suggested the farmer may be apt to regard as chimerical, and inconvenient for him to adopt in practice. This I am prepared to expect. But opposition of this kind goes for nothing. It is like the slow sailing ship in the wide sea, which is soon distanced by more active competitors. When we remember the state of the Scottish farms of old, and contrast them with the improved state of modern tillage, and knowledge of chemical properties of soils and

manures, we may observe what a few years have already produced, and what a prospect of progressive advancement is still held out. I agree with Mr Babbage, "that science and knowledge are subject, in extension and increase, to have effects quite opposite to those which regulate the material world: the farther we advance from the origin of our knowledge, the larger it becomes, and the greater power it bestows upon its cultivators to add new fields to its dominions. . . . . The mind contemplates the past, and feels irresistibly convinced that the whole already gained bears a constantly diminishing ratio to that which is contained within the still more rapidly expanding horizon of our knowledge. . . . . The experience of the past has stamped with the indelible character of truth the maxim that "*knowledge is power.*"

DESCRIPTION OF AN IMPROVED DROP-DRILL FOR TURNIP AND BONE-DUST. By Messrs SMITH, St Ninians, Stirlingshire.

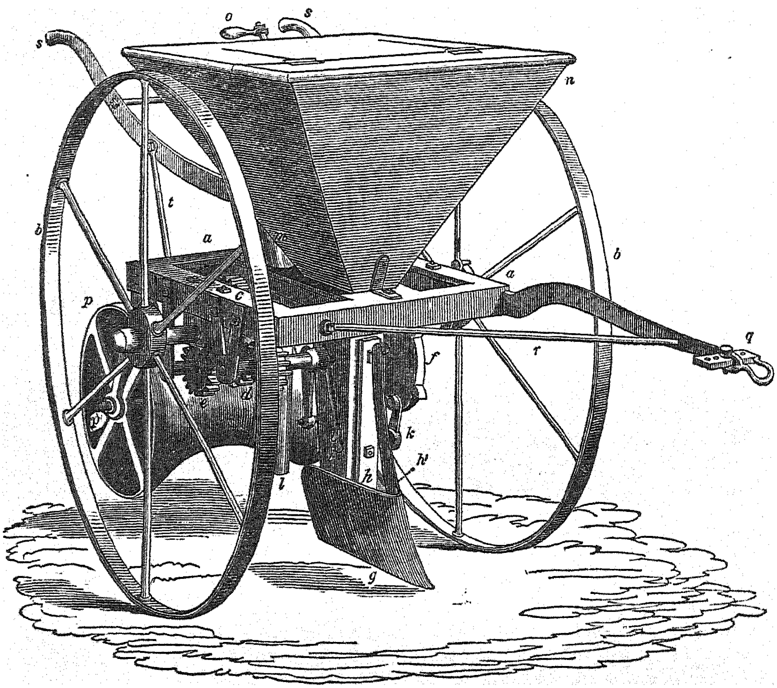
THE growing importance of the drop system of sowing turnips has induced the Highland and Agricultural Society to continue to take favourable notice of such improvements as are brought before it of the machinery employed in this branch of husbandry. Several premiums have already been given for the early and less perfect machines of this class, in its progressive state; and the last that has been awarded was given to Messrs Smith, machine makers at St Ninians, near Stirling, for their drop-drill, exhibited at the Society's General Show, held at Edinburgh in 1842.

In the progressive state of a machine of this kind, it is not to be expected that, after the first attempt, any improved form will appear that does not partake less or more of its precursors, and the present machine comes under this remark. It is, in short, a very judicious arrangement and combination of the best parts of the best machines hitherto in use, the result of which is one that promises to fulfil the required conditions more completely than any that has gone before it. The chief peculiarity in this is the introduction of a light cast-iron trunk to receive the manure from the ordinary distributing wheel, and this being provided with a *valve*, which is opened and shut by an ingenious combination of levers, allowing it to lie shut during a certain interval, while collecting a due charge of the manure, it is then suddenly opened to make the discharge, and immediately shut to collect for the next. This arrangement of the manure-depositor is supposed

to make a more decided *drop* than any of the methods hitherto adopted.

This machine is represented in operation by the accompanying cut, figure 1. It is adapted to the sowing of only one row or drill at a time, and is drawn by one horse guided by a man. It

Fig. 1.



is constructed entirely of iron, part of which is cast and part malleable. These materials are, however, not essential to its construction, there being parts of it that might do equally well in wood.

The foundation of the machine is a bed frame of cast-iron, *a a*, twenty-four inches in length by eighteen inches in breadth; having a broad longitudinal central bar to which the manure and seed hoppers and trunks are attached. The bed frame is placed upon a carriage axle, turning in wooden bearings, and with the carriage wheels, *b b*, are made of malleable iron, and are three feet diameter. The carriage axle carries a spur wheel, *c*,

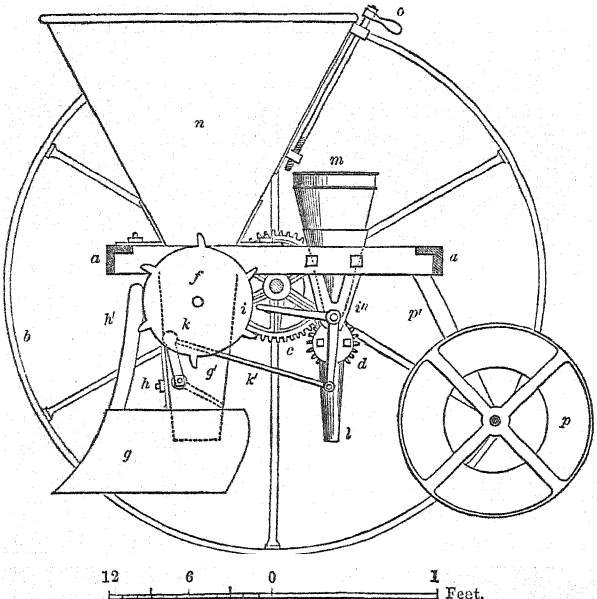
seven and a-half inches diameter, which acts upon the pinions, *d* and *e*, the first being on the axle of the manure-distributing wheel, and the second on that of the seed-distributor. The axles of these two pinions are supported at the outward ends in the attached brackets, seen on the left of the figure, while the inward ends are supported on their respective trunks and conductors. The axle of the pinion, *d*, carries the manure-distributing wheel, situate within the head of the manure-trunk, and which is three inches diameter and two inches broad, having thin-edged teeth; but the axle extends beyond the trunk, to carry the wiper wheel, *f*; and the axle of the pinion, *e*, passes through the seed-trunk to the seed-distributor. The manure-trunk with its sheath, *g*, is fixed to the middle bar of the bed frame, which is perforated for the reception of the trunk; and the sheath, which is of cast-iron, is attached to the trunk in front by means of the shank plate, *h*, with two bolts, on which it can be slid up or down to suit the depth of the intended rut. The discharging valve is placed within the trunk, hinged upon an axis, carrying at one end the lever, *k*, with a similar but shorter lever at the opposite end, acted on by a spring, as seen in the figure at *i*, keeping the valve shut.

The seed-trunk is fixed in the middle bar in the same manner; its lower extremity is seen at *l*, while its seed-box is seen at *m*. The manure hopper, *n*, twenty-two inches square at top, and four by five at bottom, is held in its place by two knee-plates, and is furnished with the usual sliding gauge, the handle of which is seen at *o*, for regulating the distribution of the manure. For the purpose of closing the rut, and covering in the seed and manure, the concave roller, *p*, is attached to the hind part of the machine, in a permanent position, by two pendant bars, *p′*; the roller is eighteen inches in length, fourteen inches diameter at the ends, and nine inches in the middle, and is suspended with its centre at nine inches above the sole of the carriage wheels.

Though this machine sows but one row, it requires, like others of its class, to be drawn by a horse; and, that the horse may walk in the furrow as well as the man who guides it, the bar to which the horse is yoked, together with the handles for the man, are placed at one side of the bed frame, and bolted thereto; of these parts, *q* is the yoke-bar or beam, supported by the stay-bar, *r*, and *ss*, are the handles, supported in like manner by the stay, *t*.

For the clearer illustration of this machine, fig. 2 is a longitudinal section, the beam and handles being kept out; and throughout the figure the same letters are applied as in the former, to denote the same parts. Here the manure-trunk, *g′*, is seen coming from behind the wiper wheel, *f*, and entering into the coulter, *g*,

Fig. 2.



and *h* is the shank-plate attached to the sheath and bolted to the trunk; *h'* is a feather to throw off any impediment that may rise on the coulter. The lever, *k'*, is fixed upon the axis of the valve, and acts in opposition to the spring already noticed, by opening the valve in the following manner:—The wipers of the wheel, *f*, as it revolves, touch in succession the horizontal arm of the bent lever, *i*, whose fulcrum is attached to the bracket, *i'*, and its vertical arm being jointed to the connecting-rod, *k'*, which again is jointed at its opposite end to the lever, *k*, of the valve. The combination thus effected opens the valve once for every wiper that passes the lever, *i*. The valve itself is here seen in dotted lines between *g'* and *k*.

The seed-distributor is quite unconnected with the manure apparatus, and is simply a metal cylinder one and a-half inches diameter, having six small chambers formed in it, each capable of holding a few seeds; these, as they pass under the vent of the seed-box, *m*, receive and retain each their portion of seed, which is successively discharged through the depositor, as the little chambers come round to the opening of *l*.

In sowing with this machine, the calculation of its parts is such as to drop at nine and a-half inch spaces, and the distance be-

tween the two depositors being also nine and a-half inches, the seed is dropt exactly above the manure, but always upon that heap which has been dropt immediately preceding.

These machines are manufactured by Messrs Smith, St Ninians, price £6, and may be also had of James Slight & Co., Edinburgh.

It may be remarked, in conclusion, that the use of the drop-drill is extending in districts where turnips are fed off with sheep; and although a smaller quantity of manure may be deposited *per acre* by it than the ordinary manure-drills, *each singled plant* may find more manure under it, to support it, than in the ordinary method of depositing the manure in a continuous line.

ON THE EFFECTS OF SOAKING SEEDS IN CHEMICAL SOLUTIONS.

There was perhaps no object in the exhibition of plants in the Society's Show at Dundee, in August, 1843, which attracted such general attention as the remarkably strong and vigorous oats growing in soil, exhibited by Mr James Campbell of the Educational Seminaries of that town. The soil in which they grew possessed no peculiar property, except that it had not been manured for eleven years. The vigour of the plants, according to Mr Campbell, was entirely to be ascribed to their seed having been subjected to a process by which they were soaked in certain chemical solutions. Mr Campbell has, since the show, in the most liberal and disinterested manner, placed the particulars of his process in the hands of the Society, for the benefit of agriculturists generally; and, to further his good intentions, the Society has thought it proper to publish his own explanation of the method of conducting the process of preparing the seed, as it is given, in letters, addressed, at various times, to the Secretary.

The first letter contains an intimation of Mr Campbell's intention to exhibit plants of oats at the Society's Show at Dundee on the 8th August, in a letter dated Seminaries, Dundee, 17th July, 1843, which was couched in these terms:—"Not being a member of the Highland and Agricultural Society of Scotland, some apology is necessary for my addressing you. Before proceeding, further, therefore, I beg leave to inform you that, some years ago, I became proprietor of about 140 acres of land, some of which stood much in need of improvement. My attention has accordingly been, for a considerable time past, directed to agri-

cultural improvement in various ways, and I conceive this may be held as an excuse for the liberty which I now take in writing you.

"Much has of late been said and written on the subject of extraneous and other manures, and a great many nostrums have been puffed off and applied with various success. Many composts have been formed, whose tendency is to yield abundant crops on certain soils, but it must still be confessed that no manure or other application of much permanency of effect, or approaching to anything like universal aptitude to soil, has yet been produced; and, in all circumstances, the expense of manures is still very great.

"The discovery, therefore, of a process by which the cereal and other gramineous seeds might be obtained in *extraordinary* abundance, without the use of manures, is certainly a great desideratum. Now, this desideratum, however strange it may appear, I have good grounds for concluding I have attained.

"It is now a considerable time since I began to imagine that if the ultimate principles of which the proximate constituents of most of the gramineous seeds are composed, could, by any possibility, be made so to enter the substance of the seed, and at the same time not to injure its vitality, as thoroughly to imbue its texture with an excess of these principles, the end would be accomplished; and it is by doing this, to a certain extent, that I am convinced I have succeeded.

"In the spring of last year (1842) I began some experiments with oats, which were going on well, when, towards the end of July, I left them unprotected, and on returning, four or five weeks after, found, to my great regret, that my labour was lost, by the depredations of poultry and sparrows. The stems were all trodden down, and not a grain left. I have this season, however, taken proper precautions, the whole being so secured that no bird or fowl can get access.

"The soil in which my seeds were sown has had no manure of any kind, to my certain knowledge, for the last *eleven* years. I have corn in the *natural state*, as well as others that have undergone the process which I use, so that a comparison of the results can easily be instituted. The results of such a comparison will be found altogether surprising. I shall be prepared to exhibit specimens of various grains, by different processes, on the 8th of August, in the proper place.

"I may only farther mention that the greater number of the stems of the oats are as thick as small canes, and the leaves from one inch to one and one-seventh inch in breadth, of a vigorous dark-green colour—that the seed was very light, not exceeding 37 lb. per bushel, and consisted of grains set aside for feeding

poultry—that the average number of stems from thirty-three seeds is eleven and a-half or twelve to each seed sown, and the gross apparent produce between five and six hundred-fold, both of oats and bear.—I am," &c.

On the 19th September following, which was only a few weeks after the plants had been exhibited at the Society's show, Mr Campbell resolved to disclose his process to the public, and communicated his intention in these terms, in another letter to the Secretary:—" When in Edinburgh, some time ago, I took the liberty of calling at your office in the Highland Society's rooms, where I saw Mr M'Donald, and stated to him that I intended to make further communications to you respecting my plan of preparing seeds so as to produce superior crops of grain.

" I have since that time resolved that my best way was to make a full disclosure of the process to the three great national agricultural institutions of Great Britain and Ireland. With this view I sent a communication, on the 8th inst., to his Grace the Duke of Richmond, who I then imagined was president of both the British Societies; but his Grace informs me that he is not now president of the Royal Agricultural Society of England, and, not being able to attend any of the meetings at Edinburgh, recommends me to apply to you, as secretary of the Highland and Agricultural Society. I therefore now take the liberty of making to you the following communication for the benefit of the agricultural interest of Scotland.

" I steeped the seeds of the various specimens exhibited in sulphate, nitrate, and muriate of ammonia, in nitrate of soda and potass, and in combinations of these, and in all cases the results were highly favourable. For example, seeds of wheat steeped in sulphate of ammonia on the 5th of July, had, by the 10th of August, the last day of the Show, tillered into *nine*, *ten*, and *eleven* stems of nearly equal vigour, while seeds of the same sample, *unprepared*, and sown at the same time, in the same soil, had not tillered into more than *two*, *three*, and *four* stems.

" I prepared the various mixtures from the above specified salts exactly neutralized, and then added from eight to twelve measures of water. The time of steeping varied from fifty to ninety-four hours, at a temperature of about 60° Fahrenheit. I found, however, that barley does not succeed so well if steeped beyond sixty hours.

" Rye-grass and other gramineous seeds do with steeping from sixteen to twenty hours, and clovers from eight to ten, but not more; for, being bi-lobate, they are apt to swell too much and burst.

" The very superior specimens of tall oats, averaging 160 grains

on each stem, and eight available stems from each seed, were prepared from sulphate of ammonia. The specimens of barley and bear were prepared from nitrate of ammonia; the former had an average of *ten* available stems, and each stem an average of thirty-four grains in the ear; and the latter an average of also ten available stems, with seventy-two grains in the ear.

"The other specimens of oats which were next the most prolific, were from muriate of ammonia, and the promiscuous specimens of oats were from nitrates of soda and potass—strong, numerous in stems, (some having not less than fifty-two,) and not so tall as either the preparations from the sulphate or muriate of ammonia.

"It was objected by some that the tallest oats were too rank, and would break down before coming to seed, but I have no fear of that, as they were strong in proportion to their height; and should there even be any ground for the objection, I am confident that a combination of sulphates of ammonia and soda, or potass, would rectify the excess of height, and render the grain equally productive.

"I have at present a series of experiments going on in the country, with seeds prepared in *seven* different ways, and sown in pure sand, and in a tilly subsoil taken six feet from under the surface, and in which there is no humus or organic matter of any kind. Along with the prepared seeds are also some *unprepared*, and I expect to be able to form a comparative estimate of their growth by visiting the place in October.

"At all events, from the experiments which I have already tried, I am quite satisfied that, even *without* the application of common manures, double crops, at least, may thus be raised; and under the application of the ordinary manures, crops *ten-fold* greater than usual.

"The various salts were prepared by me from their carbonates. —I am," &c.

The results observed on inspecting the progress of the experiments with prepared and unprepared seeds, the intention of inspecting which in October was intimated in the above letter, are thus described in a subsequent letter to the Secretary, dated Seminaries, Dundee, 16th November, 1843:—"I should before this time have given you, as I believe I sometime ago purposed to do, an account of the state in which I found the vegetation of prepared seeds which I mentioned I had sown about the middle of last August.

"I visited the place on the 12th October, and found, to my great satisfaction, that the plants from prepared seeds excelled, in a very marked degree, those from seeds sown along-side of

them, but unprepared. The former had from *five* to *eight* stems, while the latter had not more than *two* or *three* from each seed, and this in an exposed situation, and among earth which was taken from a considerable depth under the surface, (about eight feet,) a kind of reddish till, rather adhesive, and not in the least pulverized by the influence of the atmosphere; and situate in Kinross-shire, about 400 feet above the sea.

"The season of the year was, of course, not the most favourable, but the contrast was striking.—I am," &c.

Mr Campbell's sanction, obtained by application of the Secretary, to give publicity to his process, is given, in the following letter, dated Dundee, 11th December, 1843:—"I am favoured with your letter of the 9th instant, and am much gratified with the very flattering reception which my communications have met with from the Directors of the Highland and Agricultural Society.

"I have no objection to the publication in the Transactions of the whole or any part of these communications, but shall, on the contrary, feel much pleased with it. I only regret that there is not now time for communicating some further particulars, but this may be done afterwards with perhaps greater propriety.

"If the Publication Committee think proper, they may mention the price at which the liquids are to be sold.—I am," &c.

In compliance with the reasonable request contained in the concluding paragraph of this letter, the following extract is taken from the latter part of a circular addressed by Mr Campbell to agriculturists, in which he offers to supply them with his solutions, which he names his *Corn-growing Liquids*, at certain prices. The circular, after noticing the importance of such a process as the preparation of seeds, goes on to observe that—"The discoverer of this most important and invaluable process, confident, from the results of numerous experiments, of its complete success, now begs to intimate that he is prepared to supply agriculturists with his *Corn-growing Liquids* at the following prices, viz.—

"For Wheat, ...	2s. 6d.	per gallon.
Barley, ...	2s. 0d.	do.
Grasses and Oats, ...	1s. 6d.	do.

"These liquids will keep any length of time; and the seeds, when dry, will also keep without injury. The liquids are warranted not to injure in any degree the vitality of the seed, but, on the contrary, will promote its growth in an extraordinary degree.

"One-third, or even one-half, less grain is required for seed than is commonly used, and twelve gallons will impregnate eight bushels of grain; for the operation may be repeated in the residual liquid with additional measures of grain, as not more than *one-tenth* is absorbed in each operation.

"Particular printed instructions for using the liquids will accompany invoices. No order under twenty gallons will be supplied.

"1, Dudhope Street, Dundee."

REPORT OF EXPERIMENTS ON THE ACTUAL AND COMPARATIVE EFFECTS OF SPECIAL MANURES.

By Mr John Hannam, North Deighton, near Wetherby.

[Premium, Fifty Sovereigns.]

As "the object of the Society, in offering these premiums, is to obtain results which will be as valuable to the science as in the practice of agriculture"—results from which deductions may be safely drawn—the experimenter is aware that, however many points connected with the economy of manures he may have left untouched, (and all who have travelled in the field of experimental inquiry know how unbounded is its extent, and how numerous are the paths which, branching to the right and to the left, present themselves at every step of the journey,) still, if his investigations tend to establish *one new* truth or to confirm *one old one*—to *settle* that which *is disputed* or to *illustrate* that which is *commonly accepted*—if, in fact, they afford *any* information connected with the operation or the application of special manures on special crops, they will not be unwelcome to agriculturists.

That his labours might be attended with these results, in as high a degree as possible, has been the ambition of the writer. To attain this end some experience, however, in experimental observation taught him,

1st, That every experiment should be perfectly trustworthy.

2d, That each experiment should have some special object, *i. e.* should be designed to answer some useful question.

1. *To render his experiments trustworthy*, the writer's object was, in the first place, *to prevent errors* of operation, observation, or detail, and, in the second, to make the circumstances of trial *as much alike as possible* in all cases where comparative results were expected.

To prevent errors, he made it a point of necessity to design, set out, and measure, every plot upon which an application was to be made, and to weigh every tillage* himself; to see every operation (sowing, reaping, thrashing, dressing, and weighing) executed; and to record every observation and result with his own hand. To *render the circumstances of trial as fair as possible*, the possession of a soil of a similar nature throughout, naturally poor, and requiring frequent manuring; one also under a *regular system* of management, perfectly dry, in new and straight inclosures, without wood, at a moderate elevation, many miles from the sea coast, and free from *every sort* of local or incidental influence, prejudicial or beneficial, offered *unusual facilities*. In addition to which, in cases where the nature of the application called for

* It will be observed that the author uses the word "tillage" as synonymous with manure.—Ed.

it, or the number of applications was great, or where he had reason to expect any variation of the soil, he experimented on *small* plots; in others, where all circumstances were favourable, he has carried out his trials on a *large scale*. Thus, on potatoes, which depend so much on a *large* supply of manure, and upon which the effect of an application may be judged as easily and as well from half-a-dozen ridges as from a hundred—upon which, too, he had many varieties of fertilizers to try—he made his experiments on plots of a moderate size. In some cases, on turnips—which are similar to potatoes in their dependence on the tillage, and which afford equal facilities for judging of the effect of an application—where he had necessarily a large number of substances to use, the effects of some of which were quite uncertain, (as in Experiment E,) he also confined himself to plots of a small size. By this proceeding he was enabled to obtain more numerous, more comprehensive, and more correct results, as he was able in such plots to secure, if possible, a perfectly even quality of soil.

In cases, however, where the applications were less numerous, or less uncertain in their effects, and always upon corn—from which correct results cannot otherwise be obtained—his applications have been made on patches of at least a rood, and in some cases of several acres.

2. That each experiment should have some special object, and should be designed, as it were, "*to ask a question of nature*"—and that that question should be expressed so clearly that it could not be misunderstood was the next object. To effect this, his course was to *conform* to the suggestions of the Society, yet, at the same time, *not to confine* himself to them. Thus, his report will shew that he has made *every trial* suggested in the instructions to competitors, and at the same time has *added* such other as, without affecting those requested by the Society, were likely to illustrate either the science or the practice of agriculture.

Of the various experiments executed in conformity with the principles here detailed, the writer now forwards such particulars as are in his possession, and such samples of soil, grain, and manures, as may be necessary for the minute investigation of the results obtained.

To attempt to enter into such inquiries now, or to offer any *opinion* on the questions arising from these experiments, would be foreign to the object contemplated, and be out of place in what should be, and is expected to be, a report of facts merely—truths newly developed, moreover, and which, therefore, that they may be the sooner understood and the better known, should not be clothed in any garment but their own.

Of the *soil*, then, it will be merely necessary to state, that it was well adapted for the purposes of experimental inquiry, being,

as has been stated in the former page, (with the exception of soils Q and F,) of one nature—on the limestone range—and under local circumstances favourable for any comparative trial.

The *manures* used by him, the writer has reason to believe, have been, also, of fair, even quality—such as any farmer, by a little caution, may easily procure. The quantities he has employed have been such as some experience has taught him ought to be (*whatever price may be*) a fair dressing—at least such a one as should develope visible results.

In this matter of quantity he would also observe that he has not been at all guided by the *price* of the article used; because he is well aware that the price varies so, according to the locality where it is obtained, that, were it taken as the rule or measure, experiments would be of little value; for in no two places scarcely would the same quantities be employed. One would use too much—*more* than effects would pay for—and another too little—that is, *less* than would have any effect of consequence. The alteration in the prices of several articles used in these experiments will serve as a proof of this. Hence it will be seen that applications which might not pay in 1842, would have done so in 1843; yet was the manure as potent in one year as the other—the reduction of the price of the tillage being the cause.

In the real estimation of the relative values of the various applications, the column of "*cost*" has not so much to do with the subject as is generally considered. In all cases, the experimenter has used such quantities as he deemed in fair proportion, according to quality and not according to cost. In fixing, therefore, the relative values of any two applications, it will be the duty of the reader to consider the *positive effects* of each upon the crop, and to regard the *comparative cost* of each, not as here stated, but as he would *in his own* locality have found it. For instance, the writer has paid 20s. per cwt. for Potter's guano, though he is well aware that in many places it may be had at 15s. per cwt.

Amongst other applications, the experimenter has employed certain waste matters. Having been specially engaged by the Yorkshire Agricultural Society to report on this subject, these results were in his power, and, although they were not contemplated by the Highland Society, he has no doubt but that the particulars will be welcome; in the first place, because the economy of such matters is a question of importance, and at the present time one of popular interest; and, in the second, because these trials were not made to the exclusion of, but in conjunction with, others specially advised by the Society—by which proceeding the results become the more valuable; comparison lending to each additional interest.

Such, then, are the principles which have directed the experiments of the reporter. And to those who have ever *undertaken and completed a single experiment*—and who, consequently, know the troublesome manipulation (the weighing and measuring of soil and tillage; the reaping, thrashing, dressing, weighing, &c., of produce) required to ensure correct results—the time these results have to be waited for—and the anxiety arising from their liability to accidents, it will not be necessary to say that the preparation for "execution" and observation of a series like the present—comprising 137 applications—has been attended with some anxiety, some trouble, and some expense. At the same time, he would add that the "*labour*" has been one "*of love*," and, as such, in some degree, is its "*own reward*." To no other motive than this—a love of the subject—would the leisure of two years have been so readily sacrificed; yet must he confess that no reward for that sacrifice can be more grateful to him than the approbation of his fellow-labourers in the field of agricultural inquiry.

Annexed is an "Index of the samples of soil and grain, with the experiments to which they refer, and the distinguishing marks of each;" also a "List of the manures used in the accompanying experiments, with the prices paid during the respective seasons of 1842 and 1843, and the number and list of the samples of manures sent to the Society along with the present Report."

Index of the Samples of Soil, Grain, &c.

Distinguishing Marks.	No. of Samples of Soil.	No. of Samples of Grain.	Experiments to which the Samples of Soil and Grain refer.		Date.	No. of Applications in Experiments.	Page in Report.
A	1	...	Turnips, (Swede) No.	1	1842	12	167
B	1	...	Do. (white)	2	1842	12	169
C	1	...	Do. (do.)	3	1843	9	172
D	1	...	Do. (do.)	4	1843	6	173
E	1	...	Do. (do.)	5	1843	20	175
F	1	...	Rape, . .	1	1843	2	179
G	1	...	Potatoes, . .	1	1842	5	180
H	1	...	Do. . .	2	1843	15	181
I	1	5	Oats, . .	1	1842	5	184
J	1	5	Barley, . .	1	1842	5	186
K	2	7	Do. . .	2	1843	7	188
L	1	3	Do. . .	3	1843	3	192
M	1	6	Wheat, . .	1	1842	6	193
N	1	7	Do. . .	2	1843	7	195
O	1	5	Do. . .	3	1843	5	197
P	1	...	Pease, . .	1	1842	5	200
Q	1	...	Grass, . .	1	1842	4	202
R	1	...	Do. . .	2	1843	9	203
						137	

List of Manures used in the accompanying Experiments, with the Prices paid during the respective Years 1842 *and* 1843, *and the Number of Samples sent with the Report.*

No.	Samples sent.	Name of the Manure.	Price paid in 1842.	Price paid in 1843.	Cost of Carriage.
1	1	Ammoniacal liquid, . .	2d. per gallon.	... ...	$\frac{1}{2}$d. per gal.
2	1	Ammonia, sulphate of,	20s. per cwt.	... ...	1s. per cwt.
3	...	Acid, sulphuric, ...	... ...	$1\frac{1}{4}$d. per lb.	1s. do.
4	...	Do. muriatic, ...	... ...	$1\frac{1}{2}$d. per lb.	1s. do.
5	1	Bones, crushed, rough and small, ...	20s. per qr. of 24 st.	16s. per qr.	6d. per qr.
6	...	Do. dust, ...	20s. do.	16s. do.	do.
7	...	Do. rough, ...	20s. do.	16s. do.	do.
8	1	Bones, burnt, ...	20s. do.	16s. do.	do.
9	1	$\frac{2}{3}$ bones dissolved in $\frac{1}{3}$ sulp. acid, ...	... ...	*Vide* prices of 3 and 6.	*Vide* 3 and 6.
10	1	$\frac{2}{3}$ bones dissolved in $\frac{1}{3}$ mur. acid, ...	... ...	*Vide* prices of 4 and 6.	do. 4 and 6.
11	1	$\frac{3}{4}$ bones dissolved, after being calcined in $\frac{1}{4}$ acid	... ...	*Vide* prices of 3 and 6.	do. 3 and 6.
12	1	Bones, artificial, ...	... ...	8s. per cwt.	6d. per cwt.
13	1	Chemical manure, A, .	15s. per cwt.	... ...	6d. do.
14	1	Do. do. B, .	12s. do.	... ...	6d. do.
15	1	Cropping waste, ...	... ...	Nominal.	... ...
16	...	Farm manure, ...	... ...	Say 6s. per load, carriage included.	... ...
17	1	Flax waste, ...	... ...	Nominal.	... ...
18	1	Gypsum, ...	2s. 6d. per cwt.	... ...	6d. per cwt.
19	2	Guano, ...	16s. do.	12s. per cwt.	1s. do.
20	...	Do. artificial, . . .	10s. 6d. do.	... ...	... ...
21	1	Do. do. Potter's,	.. ...	19s. 6d. per cwt.	6d. per cwt.
22	1	Magnesia, sulphate, . .	... ...	8s. do.	6d. do.
23	1	Potash, nitrate of, . . .	36s. per cwt.	.. ...	1s. do.
24	1	Rape-dust, ...	22s. per qr.	18s. per qr.	6d. per qr.
25	...	Salt, ...	2s. 6d. per cwt.	... ...	6d. per cwt.
26	...	Soot, ...	6d. per bushel.	... ...	... ...
27	2	Soda, nitrate of, ...	22s. 6d. per cwt.	20s. per cwt.	1s. per cwt.
28	1	Soda, sulphate of, . . .	7s. 6d. do.	... ...	2s. do.
29	1	Singeing-dust, ...	... ...	Nominal.	... ...
30	...	Soap liquid, ...	... ...	do.	... ...
31	...	Urine, ...	... ...	do.	... ...
	24				

Notes.—1. The *ammoniacal liquid* varies in price, as well as quality, in various districts. The sample sent is from the York Works, and contains, according to Mr Spence, chemist, about 1 lb. of carbonate per gallon. The quality of the liquor from gas-works depends on the coal used. Thus, I am told by Mr Bower, chemist, Hunslet, that it is invariably poor where what is termed the "*candle coal*," or *cannal coal*, is used, while

that from the Newcastle coal is full three times as strong. Thus, while from 4 to 5 ounces of sulphate of ammonia may be obtained from a gallon of the liquid from the Leeds Works, from 12 to 15 ounces per gallon may be obtained from the London liquid.

5, 6, 7. The bones crushed, (rough and small,) the dust, and the rough, are from one stock in both years; but one sample is therefore sent; the dust and the rough bones used being obtained by putting the mixed crushed bones (No. 5) through a sieve.

8. The *bones dissolved in sulphuric acid* contain 1 bushel of bone-dust, 42 lbs. (obtained from the crushed bones, No. 5) dissolved with 21 lbs. of acid and 63 lbs. of water.

9. The *bones dissolved in muriatic acid* are obtained similarly, and contain 42 lbs. of bone-dust, with 21 lbs. of acid and 63 lbs. of water.

10. The *bones burnt, and then dissolved in sulphuric acid*, are obtained by taking 1 bushel (42 lbs.) of bone-dust (No. 5) and burning it till it weighed 27 lbs., and afterwards adding to the mass 10½ lbs. of acid, diluted with 31½ lbs. of water.

11. The *artificial bones* are manufactured by Mr Bower, of the Chemical Works, Hunslet, near Leeds, and contain phosphate of lime, phosphate of magnesia, and sulphate of lime.

12. The *chemical manure*, A, is made by Mr Dalton, York, and contains gypsum 112 lbs., sulphate of ammonia 30 lbs., and nitrate of soda 20 lbs.

13. The *chemical manure*, B, made by the same person, and called the "bone substitute," contains 112 lbs. of gypsum, sulphate of ammonia 15 lbs., nitrate of soda 10 lbs., and animal oil "*quantum suf.*"—(For further particulars, see "Lecture on Chemistry of Manures," by Mr Barker: Transactions of the Yorkshire Society for 1842.)

15, 17, 29, 30, 31, & 32. The *cropping waste*, *flax do.*, *singeing-dust*, *woollen waste*, *soap liquids*, and *urine*, being *waste* matters, have no marketable price, and consequently none is here given. For the five first I am indebted to John Heaton, Esq., of the firm of Pease, Heaton, and Co., Leeds.

16. The *farm manure* I estimate at 6s. per single horse-load on the field, *i. e.* carriage included.

20. The *artificial* guano is made after the recipe given by Professor Johnston, (*vide* Appendix to Lectures on Agricultural Chemistry and Geology, p. 32,) and the carriage of the various ingredients is included in the price.

21. The *artificial guano* made by Mr Potter, sells in London at 15s. per cwt. Being so far from town, it cost me 19s. 6d. of the agent of whom I purchased.

22. The *sulphate of magnesia* used was manufactured by Mr Bower, Chemical Works, Hunslet, and can be obtained in any quantity.

24. The *rape-dust* used in both years was from the same stock. One sample only is therefore sent.

26. The *soot* was from our own chimneys, and purchased of the sweeps; hence there is no cost of carriage affixed.

27. The two sorts of *nitrate of soda* used, it will be seen, are of very different qualities, that purchased during the present year being very much inferior to that used in 1842.

28. The *sulphate of soda* is from the works of Messrs Allen & Co., Heworth, Gateshead.

I.—Experiments on Turnips.

A.—Experiment on the actual and comparative effects upon the Swede Turnip crop, of Burnt Bones, Crushed Bones, Sulphate of Soda, Farm-Yard Manure, Guano, Artificial Guano, Nitrate and Sulphate of Soda, (mixed,) Dalton's Chemical Manure, A, Dalton's Manure, B, and Gypsum, *as Auxiliaries to Farm-yard Manure.*

Details.—Particulars of the nature, condition, and management of Soil.—Stout limestone soil, worth 26s. per acre, to rent. Condition, pretty good. Prior crops—*barley*, (rape-dusted;) *seeds*, (pastured with sheep;) *wheat*, (rape-dusted.)

Management.—After being properly cleaned, the field was ridged, (at 24 inches,) manured with six single horse-loads of farm-yard manure per acre, the seed (Matson's purple top) drilled, and the applications made as follows, (May 24, 1842):—

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
Extra Farm Manure.	Bones.	Bones burnt.	Nothing.	Sulphate of soda, top-dressing.	Guano.	Artificial Guano.	Nitrate and Sulphate of Soda.	Nothing.	Manure B.	Manure A.	Gypsum.

No. 1. Area ¼ acre, Farm manure, 6 loads (extra) applied in the ridge before drilling seed, . . May 24, 1842.
2. do. Bones crushed, 4 bush., applied along with seed by drill, . . do. do.
3. do. Bones burnt, 4 bush., do. do. do. do.
4. do. No extra application.
5. do. Sulph. of soda, ½ cwt., applied as top-dressing after hoeing.

No. 6.	Area ¼ acre,	Guano,	½ cwt.,	drilled along with earth with seed,		May 24.
7.	do.	Art. guano,	½ cwt.,	do.	do.	do.
8.	do.	Nit. of soda, Sulph. of soda,	¼ cwt., ¼ cwt.,	mixed with earth and drilled with seed,	. .	do.
9.	⅛ acre.	No application.				
10.	do.	Manure A.,	¼ cwt.,	mixed with earth and drilled with seed,		do.
11.	do.	Manure B.,	¼ cwt.,	do.	do.	do.
12.	do.	Gypsum,	½ cwt.,	do.	do.	do.

Observations.—Nos. 1, 2, 3, 4, 5,9, and 12, came up well; Nos. 6, 7, 8, 10, and 11, appeared in patches; No. 6 (guano) and No. 7 (art. guano) *looking very thin of plant.* In all the five portions, some of the seed had been injured by the application. In the course of a month, Nos. 8, 10, and 11 began to fill up the rows pretty well. No. 3 had now the lead of No. 2.

About July 1, Nos. 6 and 7 began to grow away most luxuriantly, and, though one-third of the ground was without plant, promised to make up the deficiency, At this time, Nos. 4 and 9 shewed symptoms of not being able to go the pace. No. 5 looked pretty well, and continued to thrive longer than Nos. 4 and 9.

On September 1, the various portions stood in the following order in point of excellence:—

1st,	Guano, (No. 6,) short of plant, but very luxuriant in foliage.	
2d,	Art. guano, (No. 7,) do. do.	coarse in the bulb.
	Bone-dust, (No. 2,) very good.	
	Burnt bones, (No. 3,) do.	not quite so blooming as No. 2.
	Manure B, (No. 11,) do.	rather coarse in the bulb.
3d,	Farm manure, (No. 1,) good.	
	Nit. and sul. soda, (drilled,) (No. 8,) do. coarse in bulb.	
	Manure A, (No. 10,) do. do.	
4th,	Gypsum, (No. 12,) good.	
5th,	Sul. soda, (No. 5,) fair, even crop.	
7th,	Nothing, (No. 4,) do. do.	
	Nothing, (No. 12,) . do. do.	

On January 2, 1843, five perches from each portion were carefully topped and tailed, and weighed, when the following were the

Final Results per Acre Imperial.

No.	Extra Tillage.	Quantity.	Gross Produce.			Cost of Tillage.			Increase of Produce.			No. of Turnips, per pole.
			Tons.	Cwt.	St.	L.	s.	d.	Tons.	Cwt.	St.	
1	Farm Manure	6 loads.	17	12	6	1	16	0	1	16	6	155
2	Bone-dust	2 qrs.	19	2	6	2	1	0	3	6	6	145
3	Burnt do.	2 qrs.	18	5	5	2	1	0	2	9	5	154
4	...	...	16	2	0		...			...		144
5	Sulph. of Soda	2 cwt.	17	2	6	0	19	0	1	6	6	154
6	Guano	2 cwt.	20	5	4	1	14	0	4	9	4	102
7	Art. Guano	2 cwt.	19	10	2	1	1	0	3	14	2	147
8	Nit. & Sul. Soda	1 cwt. each	17	11	1	1	13	0	1	15	1	142
9	...	...	15	10	0		...			...		153
10	Manure B.	2 cwt.	19	0	2	1	5	0	3	4	2	156
11	Manure A.	2 cwt.	18	4	0	1	11	0	2	8	0	155
12	Gypsum	4 cwt.	18	0	1	0	12	0	2	4	1	144

Conclusions.—From the following results we observe—

1°. That it is not always economy to apply a large quantity of farm manure to the turnip crop—double manure giving here only an increase of 1 ton 16 cwt. of bulbs.

2°. That, *as auxiliaries to manure*, guano, art. guano, bone-dust, burnt bones, manure B, gypsum, in the above quantities, may be applied with greater effect than six loads of farm manure.

3°. That a top-dressing of sulphate of soda has a beneficial effect, and that nitrate and sul. soda, (mixed,) drilled at same time as the seed, acts as an auxiliary to manure, 2 cwts. giving an increase of 1 ton 15 cwt. of turnips.

4°. That guano is of all the applications the most potent, 2 cwts. giving an increase of 4 tons 9 cwt. 4 st. of bulbs.

5°. That guano, art. guano, manures A and B and the saline matters, have a great tendency to injure the vitality of the seed, if placed in contact with it.

6°. That art. guano and the manures A and B, have a tendency to render the bulb coarse.

7°. That the *inorganic* constituents are the *chief* fertilizing agents in bones: thus compare results Nos. 2 and 3, where 48 st. of bones, crushed and applied to soil, give an increase of 3 tons 6 cwt. 6 st. per acre; and 48 st. of bones burnt (and thus reduced nearly one-half in weight) give an increase of 2 tons 9 cwt. 5 st.

8°. That burnt bones act quickly, but do not continue that action so long as the unburnt. (*See results.*)

B.—Compound Experiment on the actual and comparative effects upon the white Globe Turnip crop, of Bones, Burnt Bones, Guano, Artific. Guano, *as Substitutes for Farm Manure;* also of Rape-Dust, Guano, Artificial Guano, Gypsum and Urine, and Manure B, *as Auxiliaries to Bones.*

Details.—Soil—moderate limestone, worth, in its present state, 24s. per acre. Exposed on all sides, low fences, and no trees. Former crops—*seeds*, (pastured with sheep,) *wheat*, (rape-dusted,) *oats*, (rape-dusted.)

Management.—Drilled on the level, July 4, at 12 inches apart. Seed, Matson's white Globe. Tillages applied in the following order:—

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
Bones.	Burnt Bones.	Artific. Guano.	Guano.	Nothing.	Bones and Rape-Dust.	Do. and Guano.	Do. and Artific. Guano.	Do. and Gypsum.	Do. and Gypsum and Urine.	Do. and Manure B.	Do. and Nothing.

No. 1.	Area ½ acre,	Bones 1 qr.,	applied with the seed.	
2.	do.	do. 1 qr.,	do.	
3.	do.	Art. guano, 1 cwt.	do., mixed with 3 times weight of earth.	
4.	do.	Guano, 1 cwt.	do.	do.
5.	Area ⅛ acre.			

As these manures are used as *substitutes* for manure, and as it is well known that turnips will not thrive without *some* tillage, no more than one-eighth of an acre was left untilled—the effect for every purpose of experiment being as good with twenty rows across the field as with a hundred.

No. 6.	Area ⅛ acre,	Bones 1½ bush.,	and rape-dust ¾ bush.,	mixed and applied with the drill.
7.	do.	do.	and guano 1 stone,	do. do a little earth added.
8.	do.	do.	and art. guano 1 stone,	do. do. do.
9.	do.	do.	and gypsum, 2 stones.	mixed with bones and drilled.
10.	do	do.	and gypsum 2 st., and 4 galls. of urine.	mixed with earth and drilled.
11.	do.	do.	and manure B, 1 stone,	do. do.
12.	do.	do.	. . . . .	drilled.

The whole were hoed twice, and singled by the hand.

Observations.—Sec. 1st, The portions No. 3 and 4 (dressed with guano and art. guano,) came up patchy. A large share of the seed being injured. No. 2 (burnt bones) looked best at this time.

During August, No. 3 (art. guano) shewed plenty of plants, but they did not seem healthy—appearing as though the germ had been injured by the manure, so as to *retard* but not to *destroy* vegetation. No. 4 also filled up a little; it was still much too thin of plants, the manure having completely destroyed such seed as it had affected at all. The plants left, however, appeared to progress, after the first few weeks, at double the speed of any other, throwing out a rich and broad foliage.

Sec. 2d, Of the manures in conjunction with bones, rape-dust, gypsum, and urine, and manure B took the lead. The guanoed portions being partially retarded by the action of the manure on the seed. In the course of a few weeks this deficiency was made up by increased luxuriance on the part of No. 7, (guano natural.) October 1.—I placed them in the following position as to quality of crop :—

SECTION 1.

1. Guano, large and luxuriant.
2. Bones, Burnt do., very even and good.
3. Artific. guano, moderate. many small turnips.
4. Nothing, small bulbs.

SECTION 2.

1.	Bones and rape-dust,	very good.	
	do.	guano, do.,	dark foliage.
	do.	manure B,	very good.
	do.	gypsum and urine,	do.
2.	do.	art. guano,	good.
	do.	gypsum,	do.
3.	do.		do.

On November 5, five perches from each plot were measured off, and the produce topped and tailed, and weighed, when the following were the

Final Results per Imperial Acre.

		Tillage.	Quantity.	Gross Produce.	Cost of Tillage.	Increase of Produce by each Application.	No. of Turnips per Perch.
				ton. ct. st.	£ s. d.	tons. cwt. st.	
Sec. 1st.	1.	Bones (crushed) . .	2 qrs.	24 8 4	2 1 0	8 7 4	232
	2.	Bones (burnt) . . .	2 qrs.	25 17 1	2 1 0	9 16 0	243
	3.	. . . .		16 1 0		·	231
	4.	Artific. Guano . .	2 cwt.	20 11 3	1 1 0	4 10 3	266
	5.	Guano	2 cwt.	25 10 0	1 14 0	9 9 0	144
Sec. 2d.	6.	Bones and 1½ qr. Rape-dust	6 bush.	26 15 5	2 6 9	10 14 5	228
	7.	Do. and Guano . .	1 cwt.	26 8 6	2 7 3	10 7 6	222
	8.	Do. and Artific. Guano	1 cwt.	24 17 1	2 0 9	8 16 1	226
	9.	Do. and Gypsum . .	2 cwt.	24 12 6	1 16 3	8 11 6	240
	10.	Do. and { Gypsum . Urine . .	2 cwt. 32 gal.	25 14 2	1 16 3	9 13 2	231
	11.	Do. and Manure B .	1 cwt.	26 0 1	2 2 9	9 19 1	225
	12.	Bones		23 6 4	1 10 3	7 5 4	225

Conclusions.—In the preceding experiment we observe—

1°. That, as *substitutes for manure*, guano, bones crushed, bones burnt, and artificial guano, may be used with success.

2°. That *in positive effect*, as such, guano, in the proportions used, stands first.

3°. That the fertilizing properties of bones depend mainly on the *inorganic* matters contained in them. Thus, in this case, a quarter *burnt* gives a better crop than a quarter unburnt.

4°. That guano has a great tendency to injure the seed if placed in contact with it.

5°. That bones, in conjunction with other matters, may be used with great advantage as *substitutes for manure*.

6°. That it is not economical, in some cases, to use a large share of *bones only*—the effect not being in proportion to the quantity used. Thus comparing Nos. 1 and 12, 16 bushels per acre give an increase of only 1 *ton*, 2 *cwt.* over 12 bushels per acre.

7°. That rape-dust, guano, &c., may be added to 12 bushels of bones, and used with *greater success* than 4 bushels of bones extra. Thus, in experiment, the extra 4 bushels in No. 1 produces 1 ton 2 cwt. increase, when compared with No. 12, but compared with the same—

	tons. cwt. st.	
6 bushels rape-dust extra, give	3 9 1	increase over No. 12.
1 cwt. Guano, - - -	3 2 2	do.
1 cwt. Manure B, - -	2 13 5	do.
2 cwt. Gypsum, 32 gallons Urine, -	2 7 6	do.
2 cwt. Gypsum, - -	1 6 2	do.
1 cwt Art. Guano, - -	1 10 5	do.

8°. That a slight addition of urine is of use; 32 gallons increasing the crop 1 ton 1 cwt. 4 st. (*vide* Nos. 9 and 10) per acre.

C.—Compound Experiment on the actual and comparative effects upon the white Globe Turnip crop, of extra Farm Manure, Bones, Bones burnt, and Guano; also of the saline substances—Nitrate of Soda, Sulphate of Soda, Sulphate of Ammonia, and Sulphate of Magnesia—as *Auxiliaries to Farm-yard Manure.*

Details.—Limestone soil, close upon the rock; worth, to rent, 22s. per acre. Former crops—*barley*, (rape-dusted;) *seeds*, (pastured;) *wheat*, (rape-dusted.) (*Vide* sample of "Soil C.")

Management.—Land well weeded and ridged, (distance 24 inches.) Six loads of manure per acre spread in the furrow, and other tillages applied as below. Seed—Matson's purple Swede, sown June 12, 1843.

SECTION 1st.					SECTION 2d.			
1.	2.	3.	4.	5.	6.	7.	8.	9.
Extra Farm-yard Manure.	Bones.	Burnt Bones.	Guano.	Nothing.	Nit. of Soda.	Sul. of Soda.	Sul. of Ammonia.	Sul. of Magnesia.

Section 1st.	No. 1.	Area, $\frac{1}{4}$ acre,	Farm manure,	$1\frac{1}{2}$ loads put in the ridge before the seed.
	2.	do.	Bones,	4 bush. drilled with seed, June 12, 1843.
	3.	do.	Burnt do.	4 bush. do. do.
	4.	do.	Guano,	$\frac{1}{2}$ cwt. do. (with earth) do.
	5.	do.	...	... ...
Section 2d.	6.	$\frac{1}{8}$ acre,	Nit. of Soda,	$1\frac{1}{2}$ st. applied upon the manure in the ridge before drilling seed.
	7.	do.	Sul. of Soda,	3 st. do. do.
	8.	do.	Sul. of Ammon.	$1\frac{1}{2}$ st. do. do.
	9.	do.	Sul. of Magnes.	3 st. do. do.

Observations.—On the first appearance of the plants, they were attacked by the fly, and, in a few days, were completely destroyed. Not wishing to lose the results of the experiment, white Globe seed was drilled (July 3) upon the same ridges, and along the old seam, with a small hand-drill, which deposited the seed just above the tillage.

The plants came up well in every plot, and were soon free from damage from the fly. In the course of three weeks they were decidedly a-head of some which were drilled in another field, two or three days earlier, *upon fresh fallowed soil.* For some time, no difference was perceptible in any of the plots. During August, No. 4, (guano,) 6, (nit. sôda,) and 8, (sul. ammonia,) assumed the lead, having a more vigorous leaf than the rest.

On October 2, 1843, I placed them as follows :—

1.	Sul. Ammonia.	*Very* luxuriant leaf, dark and strong.
	Nit Soda.	Leaf not quite so dark.
	Guano.	do. do.
	Farm Manure.	Leaf not so luxuriant as any of the above.
2.	Bones.	Not quite so luxuriant as the above, but equal in bulb.
3.	Burnt do.	Nearly equal to do.—Good.
	Sul. Soda.	do. do.
	Sul. Magnesia.	do. do.
	Nothing.	do. do.

Dec. 18, 1843, weighed two Perches from each Plot, and ascertained the

Final Results per Imperial Acre.

Tillage.	Quantity of Tillage.	Cost Tillage.	Gross Produce.	*Increase or †Decrease of Produce.	No. of Turnips per Pole.
			Tons, Cwt. Sts.	Tons. Cwt. Sts.	
Extra Manure,	6 loads.	£1 16 0	19 17 2	*4 1 7	148
Bones, . . .	2 qrs.	1 13 0	20 3 2	*4 7 7	154
Bones burnt, .	2 qrs.	1 13 0	18 11 6	*2 16 3	159
Guano, . . .	2 cwt.	1 6 0	20 15 3	*5 0 0	143
Nothing, . .	...	...	15 15 3	...	150
Nit. Soda, .	1½ cwt.	1 11 6	18 6 0	*2 10 5	178
Sul. Soda, .	3 cwt.	1 8 6	16 7 3	*0 12 0	140
Sul. Ammonia,	1½ cwt.	1 11 6	18 2 2	*2 6 7	162
Sul. Magnesia,	3 cwt.	0 17 0	15 12 4	†0 2 7	144

Conclusions.—In the above experiment we observe—

1°. That certain substances may be used with advantage as *auxiliaries* to manure.

2°. That a moderate application of farm manure, with the above auxiliaries, is more efficacious than a larger application of manure alone.

3°. That the foregoing quantities of bones and guano are equal to 6 tons of extra manure.

4°. That certain saline applications have a beneficial effect upon the turnip crop as auxiliaries to manure: thus, nit. of soda and sul. ammonia have a marked effect on the foliage, and also on the produce of bulb.

5°. That sul. soda and sul. magnesia have no decided effect on the turnip crop when applied along with farm manure.

D.—Experiment on the actual and comparative effects upon the Turnip crop, (white Globe,) of Bone-Dust, (fine,) Bones, (½ inch,) Artificial Bones, Guano, and Potter's Artificial Guano, as *Auxiliaries to Manure.*

Details.—Soil—Limestone, worth 22s. per acre, to rent. For-

mer crops same as last experiment, being another portion of the same field. (*Vide* Sample "Soil D.")

Management.—Ridged, manured with six loads of farm-yard compost, and drilled with Swede seed, as in experiment C, and with the same result. Re-drilled with white turnips by small drill in the old seam, (July 3,) the applications having been made as follows:—

1.	2.	3.	4.	5.	6
Bones, Fine Dust.	Bones, Rough, half inch.	Bones, Artificial.	Nothing.	Guano.	Potter's Guano.

No.						
1.	Area $\frac{1}{8}$ acre,	Bones (fine dust,)	2 bushels	applied by the drill,	with seed	first sowing.
2.	do.	do (rough $\frac{1}{2}$ inch)	2 bushels	do.	do.	do.
2.	do.	do. artificial	$\frac{1}{4}$ cwt.	do.	do.	do.
4.	do.	Nothing		...	...	...
5.	do.	Guano	$\frac{1}{4}$ cwt.	do.	do.	do.
7.	do.	Potter's Guano	$\frac{1}{4}$ cwt.	do.	do.	do.

Observations.—No very marked effects from any. The manures were visible for some time, which may be accounted for by the fact that the farm manure applied was very good, well fermented, and full of moisture; hence the young plant would find ready food independently of any other source.

October 2.—All the patches look well, Nos. 1 and 5 being most luxuriant in foliage.

Dec. 18, 1843, weighed two Perches from each Plot, and ascertained the

Final Results per Imperial Acre.

No.	Tillage.	Quantity.	Cost of Tillage.	Gross Produce	Increase of Produce.	No. of Turnips per Perch.
1	Bones (dust.)	2 qrs.	£1 13 0	19 3 0	2 18 7	146
2	Do. (rough.)	2 qrs.	1 13 0	18 2 2	1 18 1	160
3	Artificial Bones	2 cwt.	0 17 0	21 2 4	4 18 3	160
4	Nothing	...	...	16 4 1	...	174
5	Guano	2 cwt.	1 6 0	21 8 4	5 4 3	148
6	Potter's Guano	2 cwt.	2 0 0	19 12 0	3 7 7	182

Conclusions.—In the above experiments we observe—

1°. That the whole of the above substances are potent *auxiliaries* to farm manure.

2°. That natural guano has the most beneficial effect.

3°. That the artificial bones have a decided and marked beneficial influence.

4°. That, even as auxiliaries to farm manure, bone-*dust* is preferable to rough bones as a tillage for the turnip crop.

E.—Compound Experiment on the absolute and comparative effects upon the Turnip crop, 1st, of Farm-yard Manure and Bones variously applied; 2d, of Guano and Artificial do.; 3d, of certain Waste Matters.

Details.—Soil—Thin limestone, worth 20s. per acre. (*Vide* "Soil E.") Former crops—*seeds*, (pastured,) *wheat*, (rape-dust,) *oats*, (no tillage.*)

Management.—Ridged at 24 inches wide, and drilled June 29, 1843, with white Globe turnips—manured as follows:—

	No.	Manures.
Sect. 1.	1.	Bones, mixed, rough and small, as from mill.
	2.	... fine dust separated from crushed bones.
	3.	... rough ½ inch do. do.
	4.	... from same stock as the above, burnt in a kiln.
	5.	... ½ quantity dissolved in sulphuric acid.
	6.	... do. dissolved in muriatic acid.
	7.	... do. burnt, and then dissolved in sulphuric acid.
Sect. 2.	8.	Farm-yard manure.
	9.	Nothing.
	10.	Guano, sown in ridge and ploughed in.
	11.	... drilled with earth along with seed.
	12.	Potter's Guano do. do.
Sect. 3.	13.	Cropping waste from stuff goods.
	14.	... and soap liquid from mills.
	15.	Woollen waste from cloth mills.
	16.	Singeing-dust from stuff mills.
	17.	Flax waste.
	18.	... and Soap liquid (fermented.)
	19.	... and Soap liquid (mixed fresh.)
	20.	... Soap liquid and Urine.

No. 1.	Area. $\frac{1}{20}$ acre,	Bones	(rough and small) $2\frac{2}{3}$ stones.
2.	do.	do.	(dust) $2\frac{2}{3}$ stones.
3.	do.	do.	(rough) $2\frac{2}{3}$ stones.
4.	do.	do.	(burnt) $2\frac{2}{3}$ st. calcined, reduced to nearly ½ weight.
5.	do.	do.	(dissolved in sulphuric acid) $1\frac{1}{3}$ st. bones, $\frac{2}{3}$ st. of acid, with three times its weight of water; after standing three days mixed, diluted with fifty times its weight of water, and applied in the furrow, which was immediately covered up by the plough and then drilled upon.
6.	do.	do.	dissolved in muriatic acid, bones $1\frac{1}{3}$ st., acid $\frac{2}{3}$ st., and three times it weight of water, treated as above.
7.	do.	do.	burnt and dissolved in sulphuric acid, bones $1\frac{1}{3}$ st. burnt till they weighed nearly $\frac{2}{3}$ st. (42 lbs., weighing after burning 27 lbs.) mixed with $\frac{6}{10}$ of a st. of acid, diluted with three times it weight of water. Applied as in the above cases.
8.	do.	Farm-yard manure ¾ load.	
9.	do.	Nothing.	
10.	do.	Guano (sown or spread in the ridge like manure) 1 st.	
11.	do.	do. (drilled, mixed with earth, under the seed) 1 st.	

* Left untilled for the purpose of this experiment, in order to test better the real effects of the various substances.

No. 12. Area. $\frac{1}{20}$ acre, Potter's Guano, mixed with earth under the seed, 1 st.
13. do. Cropping waste $2\frac{1}{2}$ st., applied in the ridge like manure.
14. do. do. $2\frac{1}{2}$ st., and soap liquid 5 gals., do.
15. do. Woollen waste $2\frac{1}{2}$ st., applied in the ridge.
16. do. Singeing-dust $2\frac{1}{2}$ st., do.
17. do. Flax waste $2\frac{1}{2}$ st., do.
18. do. do. and $2\frac{1}{2}$ st. soap liquid, 5 gals. do. (fermented.)
19. do. do. and do. do. unfermented do.
20. do. do. and $2\frac{1}{2}$ st., do. and urine 5 gals.

Observations.—The whole of sections 1 and 2 came up well, with exception of No. 11, (guano drilled,) in which some of the seed was injured, and No. 9, (nothing,) upon which, for some time, scarcely a green leaf could be seen. In the same manner the whole of section 3 appeared a failure, (the young plants scarcely appearing to grow at all for some weeks,) and were quite as backward as No. 9. No. 20 and No. 15 were, however, slight exceptions, being a little better, and No. 16 was if anything worse (half the seed never vegetating) than No. 9.

Of the other patches (sections 1 and 2) Nos. 14 and 15 (burnt and unburnt bones and sulphuric acid) started off with the lead, which they continued to increase, *being at hoeing time full a week in advance of every other except No.* 6, which followed them up very closely. At this time they almost touched in the ridges, while No. 9 (nothing) could scarcely be seen.

In the second rank, and thriving most vigorously, came farm-yard manure, bones (dust) and bones, (burnt,) (Nos. 8, 2, and 4,) and next bones rough and small, (No. 1,) and guano, (No. 10,) all looking well. After these, guano drilled, (patchy,) Potter's guano, and bones (rough) No. 3.

In this position, the whole stood at hoeing time; the most remarkable features being the decided lead taken by the dissolved bones—especially those in sulphuric acid—over every other, and the equally decided lead taken by the *fine* bone-dust over the rough, and the same superiority of the burnt bones, and the mixed, (rough and small,) over the rough alone.

The superiority of the ridge-sown guano over the drilled was also evident—the young plant not being retarded by the quick action of the manure.

The effect of a slight application of urine along with flax waste was particularly marked.

Towards the beginning of September, a change in many of the patches was observable. First, the plants on the dissolved bones appeared to stop growing in the top, and to form a quicker bulb than the other lots, while those on the guano (natural) and farm manure still continued to put forth a luxuriant dark foliage—in point of bloom, guano now being decidedly first on the whole list. Burnt bones too, appeared to stop, being now surpassed by the bone-dust, (No. 2,) and

the bones mixed. Potter's guano at this time looked well, having made good progress after hoeing. Of the bones in their ordinary states, the fine dust still kept the lead. I would notice, however, that the whole of the patches manured with bones have a smaller and lighter-coloured foliage than those dressed with farm manure or guano. The whole of section 3 is, comparatively speaking, a failure.

October 12.—Having noticed the appearance of the respective patches at various periods, the position of each at this time will not be uninteresting.

Lot 1st.—Very Good.

No. 10. Guano, (sown.)—Very luxuriant; splendid dark foliage.
11. Do. (drilled.)—Do.; short of plant in a few places.
8. Farm manure.—Do.; foliage like No. 10.

Lot 2d.—Good.

5. Bones and sulphuric acid.—Bulbs equal to Lot 1st; top small, and light colour.
6. Do. and muriatic acid.—Do.; top a shade darker.
2. Bone-dust, (fine.)—Bulbs not quite so large as Nos. 5 and 6.
1. Bones, (mixed, dust and rough.)—Do.; top same as No. 2.
12. Art. guano, (Potter's.)—Do.; top more luxuriant than any of the bones.

Lot 3d.—Moderate.

3. Bones, (rough.)—Have improved lately; will be a moderate crop.
7. Burnt bones and acid.—Not so good in appearance as they were a month since.
4. Burnt bones.—Fallen much off in luxuriance.

Lot 4th.—Bad.

15. Woollen waste.—Much worse than Lot 3d; still, better than remainder of that lot.
20. Flax and urine.—Do.; the urine has had great effect.

Lot 5th.—Very Bad.

9. Nothing.—Bad as can be imagined.
All the rest, viz. Nos. 13, 14, 19, 18, 17, 16, equally bad.

It will be remembered that the soil in this case is naturally hungry, and that it had a crop of oats after wheat, (oats, too, *without manure*,) in order that the land might be left *poor* for this experiment, and thus shew more decidedly the effects of the various articles used as substitutes for farm-yard manure.

On December 21, 1843, the produce was weighed from all the plots, and thus were ascertained the

Final Results per Imperial Acre.

	Manure.	Quantity.	Cost of Manure.			Weight of Produce.			*Increase or †Decrease.			No. of Turnips per perch.
			L.	s.	d.	Tons.	Cwts.	Sts.				
1	Bones (mixed) . . .	2 qrs.	1	13	0	15	3	4	*8	2	6	181
2	Bone-dust (fine) .	do.	1	13	0	15	17	3	*8	16	5	177
3	Bones (rough) . .	do.	1	13	0	13	3	7	*6	3	1	169
4	Bones (burnt) . .	do.	1	13	0	9	0	4	*1	19	6	156
5	Bones and Sulph. Acid	1 qr. bones, 12 st. acid.	1	15	6	13	7	6	*6	7	0	173
6	Do. and Muriatic Acid . . .	1 qr. bones, 12 st. acid.	1	19	6	17	9	1	*10	8	3	166
7	Bones (burnt) and Sulph. Acid	1 qr. bones, 6 st. acid.	1	6	0	17	7	1	*10	6	9	173
8	Farm Manure . .	15 loads.	4	10	0	22	10	3	*15	9	5	194
9	Nothing					7	0	6				200
10	Guano (sown) . .	2½ cwt.	1	12	6	22	0	3	*14	19	5	174
11	Do. (drilled) . .	do.	1	12	6	13	17	6	*6	17	0	158
12	Potter's Guano . .	do.	2	10	0	11	12	1	*4	11	3	190
13	Cropping Waste .	50 st.	...			2	9	4	†4	11	2	106†
14	Do. and Soap Liquid . . .	50 st. 100 gallons	...			3	1	4	†4	19	2	118
15	Woollen Waste .	50 st.	..			7	2	6	*0	18	0	194
16	Singeing-dust . .	do.	...			2	7	4	†4	3	2	113
17	Flax Waste . . .	do.	...			3	5	3	†2	5	4	136
18	Do. and Soap Liquid (fermented)	50 st. 100 gals. liq.	...			4	5	2	†2	15	4	134
19	Do. and Soap Liquid (fresh) .	50 st. 100 gals.	...			3	17	3	†3	3	3	141
20	Do. and Urine . .	50 st. 100 gals.	...			8	10	5	*1	9	7	152

Observation.—The small number of plants in the plots manured with the waste matters arises from the fact of there being so many without any bulb at all—having nothing but a slender fibre. These, of course, did not count.

Conclusions.—We here observe—

1°. That all the above substances, with the exception of the waste matters, act beneficially upon the turnip crop, and may be used for such, as substitutes for manure, even on poor over-cropped soil.

2°. That the waste matters, in their dry, undecomposed states, do not improve, but even deteriorate, the *turnip* crop.

3°. That natural guano has a more beneficial effect on the growth of the turnip than any other of the above tried substances.

4°. That guano should not be applied too close to the seed, as in such case it has a much worse effect, even should it not destroy the seed entirely, than when it is spread in the ridge by the hand.

5°. That bones, in all the various conditions used, act very well, though that action is much affected by such condition.

6°. That bones ground fine have a readier action and increase the crop more, on the plant, than those left rough.

7°. That bones mixed, rough and small, are also better than those entirely rough.

8°. That bones burnt have a *ready* action on the plant, but sooner fail in their influence than those unburnt; they, therefore, are not adapted for the turnip crop on a poor soil.

9°. That burnt bones, dissolved in sulphuric acid, have a more beneficial effect than burnt bones undissolved, and promote the *early* maturity of the crop.

10°. That bones dissolved in sulphuric acid or in muriatic acid have an extraordinary beneficial effect on the turnip crop, hastening the early growth, encouraging the formation of the bulb in the early season, and increasing the gross produce. (See prior remarks.)

11°. That Potter's guano acts well, and in all its effects resembles natural guano.

12°. That the saturation of any vegetable fibre or compost with liquid manure or urine is of great use to the crop. Witness the astonishing effects of urine when used with flax waste.

II.—Experiments on Rape.

F.—Experiment on the actual and comparative effect of *Bones* and *Guano* on the Rape crop.

Details.—Soil—good sandy loam, worth 45s. per acre to rent. Perfectly dry, and free from any local injurious influence. Former crops—*wheat*, (after-seeds pastured,) *barley*, (after turnips, eat.)

Management.—Prepared for, and drilled with, turnips, June 22, with tillages at same time. Turnips being destroyed by the fly, the patches sown with rape on the level, July 20, 1843, as follows :—

1.	2.
Guano.	Bones.

1.—Guano, (2 acres,) 4 cwt.—drilled with earth, along with turnip seed.

2.—Bones, (3 acres,) 6 qrs.—drilled, dust and rough, do.

Observations.—The plant appeared quickly, guano taking the lead, which it has maintained up to the present period. This superiority was at first very manifest; for, as the manure was drilled and the seed sown on its level, the effects were very visible—

the plant appearing as though it had been drilled—the lines formed by the manure being marked by the superior luxuriance of the rape immediately over them. Upon the bones this was not the case—the whole plot looking even in quality.

October. 12—The guanoed plot was better than the other considerably—both, however, considering the late period they were sown at, are good.

III.—Experiments on Potatoes.

G.—Experiment on the actual and comparative effects, upon the Potato crop, of Sulphate of Soda, Sul. and Nitrate of Soda, (mixed,) Sulphate of Soda and Sulphate of Ammonia, (mixed,) and Gypsum, used as Top-dressing *Auxiliaries to Manure.*

Details.—Soil—moderate limestone, worth 22s. per acre rental. Prior crops—*barley*, (rape-dust,) *seeds*, (pastured,) *wheat*, (rape-dust.)

Management.—Ridged at 27 inches, and set with American natives, (cuttings,) May 6, 1842. Manured, on the top of the sets, with 16 loads of farm-yard manure per acre, and top-dressed as follows:—

1.	2.	3.	4.	5.
Sulphate of Soda.	Sul. Soda and Nit. Soda.	Sul. Soda and Sul. Ammonia.	Nothing.	Gypsum.

No. 1.	10 Ridges, area ½ of an acre.		Sulphate of Soda, 2 st.—applied June 18.		
2.	Do.	do.	Sulphate of Soda, 1 st. / Nitrate of Soda, 1 st.		do.
3.	Do.	do.	Sulphate of Soda, 1 st. / Sulph. Ammonia, 1 st.		do.
4.	Do.	do.	Nothing.		
5.	Do.	do.	Gypsum	5 st.	do.

Observations.—Dry weather (with the exception of a slight shower) coming after the application was made, the sulphate of soda appeared to blister the leaves of the plants. In a few weeks, the effects of the sulphate of ammonia was very evident, in the rich dark green foliage of the plants, upon No. 3. No. 2 (dressed with the mixture of nitrate and sulphate of soda) shewed, in a less degree, similar results—the foliage being improved in colour and strength by the application. Nothing else particular was observable in any of the plots till the whole were gathered and weighed, with the following results:—

		sts.	lbs.		sts.	lbs.
No. 1.	Large Potatoes,	174	12	Small do.	48	6
2.	do.	187	4	do.	33	12
3.	do.	228	6	do.	47	2
4.	do.	177	8	do.	37	7
5.	do.	182	5	do.	46	..

From these particulars, at 84 lb. in the bushel, we have the

Final Results per Imperial Acre.

	Tillage.	Quantity.	Gross Produce. Large.	Small.	Cost of Tillage. £ s. d.	*Increase or † Decrease of Crop.	
1.	Sul. Soda	2 cwt.	233 bush.	64 bush.	0 19 0	†3	*14
2.	Sul. Soda, Nit. Soda,	1 do 1 do	250 do	45 do	1 13 0	*14	†5
3.	Sul. Soda, Sul. Ammon.	1 do 1 do	305 do	62 do	1 10 6	*69	*12
4.	Nothing,		236 do	50 do			
5	Gypsum,	5 cwt.	243 do	61 do	0 15 0	*7	*11

Conclusions.—In the above experiment we observe—

1°. That sulphate of soda increases the amount of small potatoes, *i. e.*, it *encourages* the *formation* of, but does not *support* an *increase* of tubers.

2°. That nitrate of soda, along with sulphate of soda, does encourage and also *support* an increased production of tubers.

3°. That sulphate of ammonia as a top-dressing, along with sul. soda, has a similar though more potent effect.

4°. That gypsum—so largely used in many countries for the potato crop—has also a beneficial effect upon the yield of the potato.

4°. That nitrate of soda and sulphate of ammonia promote, in a similar manner, the luxuriance of the foliage, giving upon potatoes, as upon grain and turnips, a darker green leaf than the other manures used.

H.—Compound Experiment on the actual and comparative effects of Farm Manure, Farm Manure and Gypsum, Guano, Guano and Gypsum, and certain Waste Matters from Manufactories, *as Manures for the Potato crop.* Also on the actual and comparative effects upon the Potato crop of Artificial Bones, Nitrate of Soda, Sulphate of Ammonia, Sulphate of Magnesia, and Sulphate of Soda, as *Auxiliaries to Farm-yard Manure.*

Details.—Soil—thin limestone; annual value, about 24s. per acre. Prior crops—*barley*, (rape-dusted,) *seeds*, (pastured,) *wheat*, (rape-dusted.)

Management.—Ridged at 27 inches; planted with potatoes, (American natives,) May 20, 1843, and manured as follows:—

Section 1st.									Section 2d.					
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
Farm Manure.	Farm Manure and Gypsum.	Guano.	Guano & Gypsum.	Nothing.	Singeing Dust.	Croppings.	Flax Waste and Soap Liquid.	Woollen Waste.	Farm Manure and Artificial Bones.	Do. and Nitrate of Soda.	Do. and Sulphate of Soda.	Do. and Sulphate of Ammonia.	Do. and Sulphate of Magnesia.	Farm Manure only.

Section 1st.	No. 1.	Area $\frac{1}{16}$ acre or 8 drills.	Farm manure $1\frac{1}{4}$ loads—put on the ridge.	
	2.	do	do	and Gypsum 35 lbs., put on the ridge.
	3.	do	Guano, 35 lbs.	do
	4.	do	do 35 do and Gypsum 35 lbs.	do
	5.	do	Nothing.	
	6.	$\frac{1}{32}$ acre or 4 drills,	Singeing Dust, $3\frac{1}{8}$ stones.	
	7.	do	Croppings, $3\frac{1}{8}$ stones.	
	8.	do	Flax waste, $3\frac{1}{8}$ st. and Soap liquid, $6\frac{1}{4}$ galls.	
	9.	do	Woollen waste, $3\frac{1}{8}$ stones.	
Section 2d.	10.	$\frac{1}{16}$ acre.	Artificial bones, 21 lbs. & Farm man., $1\frac{1}{4}$ loads, (mixed.)	
	11.	do	Nitrate of soda. $10\frac{1}{2}$ lbs.	do
	12	do	Sulphate of soda, 21 lbs.	do
	13.	do	Sulphate of ammonia, $10\frac{1}{2}$ lbs.	do
	14.	do	Sulphate of magnesia, 21 lbs.	do
	15.	do	Farm manure, $1\frac{1}{4}$ loads only.	

Observations.—Sec. 1st.—Nos. 1 and 2 came very well up. Nos. 3 and 4 seemed, for a week or two, as though the dose had been too strong for the young plants—no difference was perceptible from the addition of gypsum to the farm manure and to the guano. Nos. 5, 6, 7, 8, and 9 came more slowly than the rest of the section, and were a week behind at hoeing time.

After hoeing, the guano patches began to grow away with astonishing vigour, and soon came up with the farm manure; the others following, *sed longo intervallo*. Of these, No. 6 (singeing-dust) was by far the worst, looking as though the application had injured or retarded germination—indeed *nothing* (No. 5) was superior to it.

During the month of August, great improvement took place in the patches 6 and 7, the foliage assuming a dark luxuriant colour, approaching that of the guanoed patches. No. 7, however, took the lead. At *October* 2, the various patches stood in order of excellence as below.

Section 2d.—Nothing peculiar was observable in the early

appearance of any of these plots. All came very well, and continued to flourish equally for some weeks, when No. 13 assumed the lead, and was closely followed by No. 11; No. 13 (sul. ammonia) putting out a foliage like that of the guanoed plots (Sec. 1st) and No. 11 (nit. of soda) assuming a similar luxuriance of leaf. On October 2, they stood as below—

(Substitutes for Farm Manure.)

1.	Guano.	First-rate;	very luxuriant in foliage.
	Do and Gypsum.	Do	do
	Manure.	Do	not so dark as the above in the leaf.
	Do and Gypsum.	Do	no difference.
2.	Croppings, (No. 7.)	Good;	very dark leaf.
3.	Woollen waste, (No. 9.)	Pretty good.	
4.	Flax do (No. 8.)	Moderate.	
	Nothing, (No. 5.)	Do	
	Singeing, (No. 6.)	Do	dark in the leaf.

(Auxiliaries to Farm Manure.)

1.	Sul. ammonia, (No. 13.)	First-rate;	very dark and luxuriant in the stem.
2.	Nit. of soda, (No. 11.)	Do	not quite so dark in colour.
3.	Artificial Bones.	Very good;	light-coloured leaf.
	Sul. soda.	Do	do
	Sul. magnesia.	Do	do
	Nothing.	Do	do

The weight of the whole produce of each plot, in November 1, 1843, ascertained the

Final Results per Imperial Acre.

		Name of Tillage	Quant.	Cost of Manure.			Gross Produce of Large.	Gross Produce of Small.	Total Produce.	*Increase or †Decrease of Produce. Large.	*Increase or †Decrease of Produce. Small.	Total *Increase or †Decrease
		As Substitutes for Man.		£.	s.	d.	bush.	bush.	bush.	bush.	bush.	bush.
Sect. 1.	1	Farm Manure -	20 load	6	0	0	165.5	63.2	228.7	*48.4	*9.3	*57.7
	2	Do. and Gypsum	20 load 5 cwt.	6	15	0	194.0	63.2	257.2	*76.9	*9.3	*86.2
	3	Guano - - - -	5 cwt.	3	5	0	161.8	68.8	230.6	*44.7	*14.9	*59.6
	4	Do. and Gypsum	5 ct. ea.	4	0	0	189.6	37.2	226.8	*72.5	†16.7	*55.8
	5	Nothing - - -					117.1	53.9	171.0			
	6	Singeing-dust -	100 st.	nominal			53.9	39.0	92.9	†63.2	†14.9	†78.1
	7	Croppings - - -	100 st.	do			120.8	83.7	204.5	*3.7	*29.8	*33.5
	8	Flax waste and Soap liquid -	100 st. 200 gal.	do			132.0	66.9	198.9	*14.9	*13.0	*27.9
	9	Woollen waste -	100 st.	do			128.3	65.0	193.3	*11.2	*11.1	*22.3
		As Auxil. to farm man.										
Sect. 2.	10	Artificial Bones -	3 cwts.	1	5	6	206.6	72.5	279.1	*43.6	*19.1	*62.7
	11	Nitrate of Soda -	1½ cwt.	1	11	6	239.9	53.4	293.3	*76.9		*76.9
	12	Sulphate of Soda -	3 cwts.	1	8	6	163.0	63.2	226.2		*9.8	*9.8
	13	Sulphate of Ammonia	1½ cwt.	1	11	6	239.9	61.3	301.2	76.9	*7.9	*84.8
	14	Sulphate of Magnesia	3 cwts.	1	5	6	176.7	57.6	234.3	13.7	*4.2	*17.9
	15	Farm manure	20 ton				163.0	53.4	216.4			

Observation.—The items in the columns of "Increase or Decrease of Produce" of the various plots in Section 1st are

obtained by comparing the gross produce of each with the produce of No. 5; those in Section 2d are obtained by taking No. 15 as the standard of comparison.

Conclusions.—In the foregoing trials we see—

1°. That guano may be used as a substitute, cheap and efficacious, for the growth of potatoes.

2°. That gypsum has a beneficial effect when used as an auxiliary to farm manure.

3°. That the waste matters (with the exception of singeing-dust) act beneficially on the crop.

4°. That singeing-dust appears to retard the vegetation of the plant.

5°. That, as an auxiliary to farm manure, the artificial bones act well.

6°. That a saline application is, in some cases, a useful auxiliary to farm manures, and in others worthless.

7°. That sulph. ammonia and nitrate of soda act extremely well as such application; improving the foliage, the gross produce of tubers, and also the quality of the same, as they do not appear to increase the small potatoes so much as the large ones.

8°. That sul. magnesia has a slight beneficial effect and sul. soda also, the latter slightly increasing the quantity of small potatoes.

The experimenter would here observe that, in his opinion, the potato crop is one to which experiment should be particularly directed, because it is a crop which is of very great *acreable value*, one which is valuable as supplying winter food for cattle, and one which, on some lands, prepares the soil for barley. It is, however, said that it is a crop which a good farmer (unless on warp soils, &c.) should not cultivate except for family use. But what is the reason of this? It is because it is an *expensive crop*; because it robs the rest of the farm of the manure which may be more advantageously applied, as 6 or 8 acres of potatoes, on a farm of 150 acres of arable land, make sad havoc in the manure heap. If, however, we can find a *substitute* for farm manure, or even an *assistant* to it, we do away with this robbery of the manure heap, and may then leave the grass, seeds, and turnip-lands, to have their share of the compost heap, and yet, at the same time, secure a crop worth £12 to £20 per acre, make sure of winter food for our cattle, (for Swedes cannot be entirely depended on always, witness the present year,) and prepare our soil for barley. This I know well may be done by an outlay of from £3 to £4 in rape-dust, and present experiments infer that it may by an equal outlay in guano.

IV.—Experiments on Oats.

I.—Experiment on the actual and comparative effects upon the

Oat crop of Nitrate of Potash, Nitrate of Soda and Salt, (mixed,) Salt, (only,) and Rape-dust.

Details.—Soil—thin limestone, worth 20s. per acre rental—exposed to the north. Prior crops—*barley*, (after turnips, eaten on,) *seeds*, (pasture,) *wheat*, (rape-dusted.)

Management.—Hopetoun oats, drilled April 4, 1842, and the following tillages applied :—

1.	2.	3.	4.	5.
Nit. Soda and Salt.	Nit. of Potash.	Nothing.	Common Salt.	Rape-Dust.

No. 1.	Area $\frac{1}{4}$ acre,	nit. soda $1\frac{1}{2}$ st., salt 3 st. applied as a top-dressing, May 2.		
2.	do.	nit. of potash 2 st.	do.	do.
3.	do.	nothing.		
4.	do.	salt 6 st., applied as a top-dressing, May 2.		
5.	do.	rape-dust 3 bush., drilled with the seed, April 4.		

Observations.—Rain coming a few days after the top-dressings were applied, the effects upon Nos. 1 and 2 were soon visible in the dark-green hues assumed by the young plant. No. 5 (rape-dust) at this time was much a-head of all the other patches, owing to the manure having been applied when the grain was drilled. During June, Nos. 1 and 2 came up with No. 5, No. 3. (nothing,) and No. 4, (salt,) being much in the background.

July 1.—A change had now taken place in the respective positions, as regarded appearance, of the plots, No. 4 having made a push that quite astonished me. At this time they stood thus—

1.	No. 1, nit. soda and salt, long and rich in foliage.			
	2, nit. potash,	do.	do.	partially lodged.
	4, Salt, good standing crop.			
2.	5, rape-dust, good.			
3.	3, nothing, full of plant but shorter in the straw than the other patches.			

In this order they stood up to August 24, when they were reaped; and, after being well fielded, were thrashed immediately, with the following results :—

No. 1, gave	175	sheaves yield.	588	lbs. of straw,	431	lbs. of gr. weighing	40	lbs. p. bu.
2,	172	do.	582	do.	416	do.	40	do.
3,	150	do.	512	do.	378	do.	$40\frac{1}{2}$	do.
4,	180	do.	601	do.	451	do.	41	do.
5,	162	do.	561	do.	410	do.	40	do.

From the above we therefore obtain the following :—

Final Results per Imperial Acre.

No.	Tillage.	Quanity of Tillage.	Gross Produce.		Cost of Manure.	Increase of		Weight, per Bushel.
			Grain.	Straw.		Grain.	Straw.	
			Bushels.	st, lbs.	L. s. d.	Bushels.	st. lbs.	Lbs.
1	Nit: Soda and salt.	6 stone. 12 stone.	43.1	168 0	1 2 1½	5.76	21 10	40
2	Nit. Potash.	1 cwt.	41.6	166 4	1 16 0	4.26	20 0	40
3	Nothing	...	37.3	146 4	...	...	...	40½
4	Salt - -	24 stone.	44.0	171 4	0 9 0	6.66	25 6	41
5	Rape-Dust	1¼ qrs.	41.0	160 4	1 13 9	3.76	14 0	40

Observation.—Be it observed that the straw here weighed is the good marketable straw, and does not include the short and broken, which goes away in what is technically termed "falls" or pulls.

Conclusions.—In this experiment we observe—

1°. That, for the oat crop, upon soil which has been for a length of time under a system of rape-dust tillage, a dressing of saline manures may be used with greater effect than another application of rape-dust.

2°. That in such cases, common salt has a tendency to increase both the quality and the quantity of grain, and to increase the quantity of grain in a greater ratio than the quantity of the straw.

5°. That nit. of soda, mixed with salt, increases the quantity of straw and grain in a greater degree than nit. of potash, and in a less degree than salt only.

6°. That nit. of potash increases the straw in a greater ratio than the grain, and diminishes the weight per bushel.

7°. That rape-dust increases both straw and grain, and diminishes the weight per bushel of the grain.

8°. That the nitrates act more quickly than salt.

9°. That the nitrates render the straw bulky, soft, and coarse; while salt makes it white and brittle.

V.—Experiments on Barley.

J.—Experiment on the actual and comparative effects on the Barley crop, of Nitrate of Potash, Nitrate of Soda and Salt, (mixed,) Salt, (only,) and Rape-dust.

Details.—Soil—good turnip soil, upon the limestone range, worth 26s. per acre, rental. Situation—level, and free from all extraneous influences. Prior Crops—*seeds*, (pastured;) *wheat*, (rape-dust;) *turnips*, (farm manure, and partially consumed on the land by sheep.)

Management.—Drilled, April 6, 1842, and applications made as follows:—

1.	2.	3.	4.	5.
Nit. Soda & Salt.	Nitrate of Potash.	Nothing.	Salt.	Rape-dust.

No. 1.	Area ¼ acre,	Nit. soda, 1½ st. Salt, 3 st.	applied as a top-dressing, May 2, 1842.	
2.	do	Nit. potash, 2 st.	do	do
3.	do	Nothing.		
4.	do	Salt, 6 st.	do	do
5.	do	Rape-dust, 3 bush. drilled with the grain.		

Observations.—This experiment being precisely similar to the preceding one upon oats, and made at the same time, the effects in both cases were very similar. At the time of top-dressing, rape-dust (No. 5) had the lead, which it maintained somewhat longer than in the oats, as the effect of the saline dressings upon the foliage of the plant was not so visible as in the other case. The bulk, however, was increased, though the colour was not so much affected in Nos. 1 and 2, so that on July 1, I placed Nos. 1, 2, and 5 equal, No. 4 next, and No. 3 last—all, however, being good. During the month of July, No. 4 made an extraordinary push, so that at the end of the month they stood thus:—

1.	No. 4, Salt.	Very good;	forward.
	1, Nit. soda and Salt.	do	rather coarser in the straw.
2.	2, Nit potash.	do	stronger in the straw than any other.
3.	5, Rape-dust.	Good;	forward.
4.	3, Nothing.	Fair crop;	forward.

At reaping time, the above peculiarities were more fully developed. Thus, Nos. 1, 4, and 3 were riper than No. 2. Nos. 2 and 1 were coarser in the straw than the other, especially No. 2, which was much lodged. No. 4 was particularly white and brittle in the straw, and was fit for cutting before any other portion. No. 5 was also yellow in the straw; while No. 1 was darker than 4, and lighter in colour than 2. By these features the plots were distinguishable by the casual observer.

After reaping, August 29, 1842, the produce of the several plots was well weathered, and then thrashed, with the following results:—

No. 1.	gave	234	sheaves, yield.	830 lb.	straw &	670 lb.	of grain, weigh.	56 lb.	p. bush.
2.	do	233	do	860	do	668	do	55	do
3.	do	178	do	680	do	524	do	56	do
4.	do	236	do	792	do	696	do	57	do
5.	do	205	do	814	do	612	do	55½	do

From these results per rood we obtain the following

Final Results per Imperial Acre.

No.	Name of Tillage.	Quantity.	Gross Produce.			Cost of Manure.			Increase of		Weight of Grain p. bush.
			Grain.	Straw.					Grain	Straw.	
			Bushels.	St.	lb.	L.	s.	d.	Bushel.	St. lb.	
1	{ Nit. soda / Salt }	6 st. / 12 st.	47.84	237	2	1	2	1½	10.42	42.12	56
2	Nit. Potash	8 st.	48.58	245	10	1	16	0	11:16	51 6	55
3	Nothing	...	37.42	194	4		...		...	...	56
4	Salt	24 st.	48.84	226	4	0	9	0	11.42	32.0	57
5	Rape-dust	1½ qrs.	44.08	232	8	1	13	9	6.66	38.4	55½

Conclusions.—In this experiment we observe—

1°. That, upon a soil which has had rape-dust as a manure for a length of time, a dressing of saline manures may be advantageously used upon the barley crop.

2°. That, as upon oats, so upon barley, common salt has a tendency to increase the quantity of grain in a greater ratio than the straw, to improve the *quality* of the grain, and to render the straw white and brittle, and to promote its ripening.

3°. That the nitrates have a tendency to increase the quantity of straw in a greater ratio than the grain, to render the straw soft and bulky, and to retard slightly the ripening.

4°. That the nitrates have not such a decided effect upon the colour of the young plant of barley as upon oats or wheat.

5°. That the action of salt upon the crop is not visible so soon as that of the nitrates.

6°. That rape-dust has a tendency in this case to diminish the weight of the grain per bushel.

7°. That nitrate of potash also diminishes the weight per bushel of the grain.

K.—Experiment on the actual and comparative effects upon the Barley crop, of Rape-dust, Guano, Rape-dust and Salt, Nitrate of Soda, and Nitrate and Sulphate of Soda.

Details.—Good limestone soil, worth 24s. per acre per annum; exposed to the north; low fences; no trees. Prior crops—*barley*, (upon turnips eaten on the land;) *seeds*, (pastured;) *wheat*, (rape-dust;) *turnips*, (bones, crop pulled off.)

Management.—Ribbed and sown April 10, 1843, with barley and clover seeds. Manures applied as follows:—

1.	2.	3.	4.	5.	6.	7.
Nothing.	Rape-dust.	Guano.	Rape-dust and Salt.	Nit. of Soda.	Nit. of Soda and Sul. Soda.	Salt.

No 1.	¼ acre.	Nothing.			
2.	do.	Rape-dust, 3 bush., sown in the furrows with the seed.			
3.	do.	Guano, 4 st.	do.		do.
4.	do.	Rape-dust, 3 bush. and Salt, 3 st.,	do. applied as a top-dressing, May 3.		do.
5.	do.	Nitrate of soda, 3 st.		do.	do.
6.	do.	Nitrate of soda, 2 st. Sulphate of soda, 2 st.	mixed, and do.		do.
7.	do.	Salt, 8 st.	do.		do.

The remaining portion of the field (about 5 acres) was manured with 2 cwts. of guano per acre, in alternate lands or stitches, with 12 bushels of rape-dust per acre.

Observations.—The effects of the guano and rape-dust were distinctly marked from the first appearance of the plant—the portions left for a top-dressing being in one month a full week behind the Nos. 2 and 3. If anything, No. 3 had the lead of the two.

At the beginning of June, the top-dressings had not begun to shew any effects, Nos. 1, 5, 6, and 7, being much in the background. Indeed the difference between them and Nos. 2, 3, and 4, could be seen half-a-mile off. At this time No. 3 was very decidedly superior to No. 1. This was the case, too, throughout the field, the lands dressed with guano being very distinguishable by their superior luxuriance from those manured with rape-dust.

A week of fine weather, about the middle of June, coming after a month of almost constant rain, made a wonderful improvement in the top-dressed portion; so much so, that some of them (Nos. 5 and 6) came up with No. 2, which had not progressed so well as No. 3. No. 4, however, at this time pressed No. 3 very closely in the race; so that, at the end of July, the whole field, with the exception of No. 1, (unmanured,) was a splendid crop. The experimental plots at this time stood as follows:—

1. (No. 3) Guano. Splendid crop, thick and luxuriant.
2. (No. 4) Rape-dust and salt. Do., not quite so luxuriant; more forward.
3. (No. 5) Nit. of soda. Nearly equal to the preceding; rather more backward.
4. (No. 6) Do. and sulp. soda. Not quite so good as No. ; backward.
   (No. 2) Rape-dust. Equal to No. ; not quite so backward.
5. (No. 7) Salt. Not so luxuriant in the straw; very forward.
6. (No. 1) Nothing. Very poor crop; much worse than any of the above.

The remainder of the field was a very excellent crop.

The lands guanoed were, however, decidedly superior in every case to the rape-dust. On one marly hill, where there is scarcely an inch of soil, (the whole being formed of shelly limestone and chalky marl mixed,) and from which the turnips (grown with bones *only*) had been carted away, it was surprising to see the effect of the guano. The place where every handful had fallen was particularly marked, and the whole crop (where scarcely ever a crop, under more favourable circumstances, grew well before) was good. At this time an extensive dealer in rape-dust and bones went over the field with me, and gave, without hesitation, his opinion that the guano beat the rape-dust throughout the field by a quarter per acre. This gentleman, Mr Robert Snowdon, was the very person who had supplied the rape-dust used in the experiment; his testimony, therefore, was decidedly free from prejudice *in favour* of guano.

As a curiosity, I send a sample of the soil from the marly hill alluded to, where, by the aid of guano, a crop of barley, of full 4 quarters per acre, was produced after turnips pulled off the land. (*Vide* "Extra Sample of Soil," marked "K.")

At reaping time, certain peculiarities were observable. No. 1, thin and short in the straw, was ripe first. No. 7, (salt,) though backward at the time the top-dressings were applied, was ripe sooner than any other, except No. 1. The straw was white and brittle. No. 4 partook of these peculiarities in a less degree. Nos. 5 and 6 (nitrated) were ripe last, having been at the time of top-dressing a full week behind Nos. 2 and 3. The straw of these portions was very yellow and coarse, appearing as though it had been forced to a quick vegetation. The straw of the patches 2 and 3 (rape-dust and guano) was yellow and soft. All the plots, with the exception of No. 1, which was too light to break down, were lodged so much, that they were very difficult to mow. Nos. 7 and 4 were less lodged than the others.

The whole of the field was mown, August 30, and the produce of the various patches kept separate, when, after being well weathered, the following were the results obtained from each plot:—

					lbs.		lbs.				
1.	gave	206,	sheaves	yielding	587	of straw, and	421	of grain,	weighing	$54\frac{3}{4}$	p. bush.
2.	do	212	do	do	644	do	496	do	do	$54\frac{3}{4}$	do
3.	do	255	do	do	785	do	625	do	do	54	do
4.	do	206	do	do	738	do	622	do	do	55	do
5.	do	219	do	do	730	do	603	do	do	$53\frac{3}{4}$	do
6.	do	201	do	do	695	do	579	do	do	$54\frac{1}{4}$	do
7.	do	187	do	do	607	do	554	do	do	$55\frac{3}{4}$	do

Final Results per Imperial Acre.

No.	Manure.	Quantity.	Gross Produce.		Cost of the Manure.	Increase of	
			Grain.	Straw.		Grain.	Straw.
			Bushels.	St. lbs.	L. s. d.	Bushels.	St. lbs.
1.	Nothing, . .	...	30.75	167 10	...	...	...
2.	Rape-dust, . .	12 bush.	36.23	184 0	1 7 9	5.48	16 4
3.	Guano, . . .	2 cwts.	46.29	224 4	1 6 0	15.54	56 8
4.	Rape-dust and Salt, . .	12 bush. 12 st.	45.23	210 12	1 12 3	14.48	43 2
5.	Nitrate of Soda,	1½ cwt.	44.87	208 8	1 11 6	14.12	40 12
6.	Nit. of Soda, Sul. of Soda,	1 cwt. 1 cwt.	42.30	198 8	1 10 6	11.55	30 12
7.	Salt, ...	4 cwt.	39.74	173 6	0 12 0	8.99	5 10

Observe here that the weight of straw upon No. 1 is greater than it would have been had there been no clover seeds sown, as the light crop of barley *encouraged* the growth of the clover, while the heavier bulk of straw upon the other plots *retarded* its growth. Hence the straw of No. 1 weighed well, and the *gain* of straw on the other patches appears less than it really was. Again, the same circumstance affected the number of sheaves on No. 1; the quantity of clover making it necessary to bind *small sheaves.*

Conclusions.—In this case we see—

1°. That guano is superior to rape-dust.

2°. That saline applications may be used with success upon soil *requiring manure.*

3°. That nitrate of soda increases the crop of straw and grain, and that sul. soda mixed with nitrate does not improve the crop so much as nitrate alone; hence we infer that nitrate of soda has a *positive effect*, and sulphate a *negative* one, upon the barley crop.

4°. That salt increases the *grain* more than the *straw.*

5°. That salt, *as a top-dressing auxiliary to rape-dust*, is extremely valuable; improving the produce in quantity and quality. (*Vide* gain per acre, and weight per bushel, of No. 4.)

6°. That salt alone, or mixed with another substance, has the same visible effects—acting at the latter period of the plant's growth, and blanching the straw and stubble.

7°. That guano and nitrate of soda diminish the weight per bushel of the grain produced.

L.—Experiment on the comparative effects on the Barley crop, of Rape-dust, Rape-dust and Salt, and Guano.

Details.—Soil—moderate limestone, worth 24s. per acre per annum. Prior crops—*wheat*, (rape-dust,) *oats*, (rape-dust,) *turnips*, (bones—eaten on the land.)

Management.—Sown with clover seeds, and drilled with barley, May 6, 1843. Manures applied as follows :—

1.	2.	3.
Rape-dust.	Rape-dust and Salt.	Guano.

No. 1. ½ acre. Rape-dust, 6 bush. ; drilled along with the seed.
2. do Rape-dust, 6 bush., and salt, 6 stones, mixed and drilled with the seed.
3. do Guano, 1 cwt. ; mixed with earth, and do. do.

Observations.—The whole came up well, no difference being visible in any of the three for some time, when No. 3 took the lead. All the plots throve well, and, though sown late, at harvest promised a very fair crop. The clover seeds came equally well in all the patches. On reaping, September 7, No. 3 still had the advantage in weight of straw; No. 1 being also a shade better than No. 2 in quantity of straw. No. 2, however, shewed somewhat similar effects from the application of salt that we observed in the other experiments on barley ;—the straw was whitened, sooner ripe, and promised a better yield. The seeds were equally good throughout. The following were the results from each portion :—

1. 370 sheaves, yielding 1142 of straw, and 902 of grain, weighing 56 per bushel.
2. 314 do do 1124 do 918 do do 56½ do
3. 376 do do 1192 do 948 do do 56 do

From the above we obtain the following

Final Results per Imperial Acre.

No.	Name of Manure.	Quantity.	Gross Produce. Grain.	Gross Produce. Straw.		Cost of Manure.			Weight per Bushel.
			Bushels	St.	lbs.	L.	s.	d.	
1.	Rape-dust. . .	12 bush.	32.21	163	1	1	7	9	56
2.	Rape-dust & Salt.	12 bush. & 12 st.	33.55	160	4	1	12	3	56½
3.	Guano, . . .	2 cwt.	32.78	170	2	1	6	0	56

Conclusions.—In this experiment we note—

1°. That guano and rape-dust, in comparative effect, are nearly equal; from want, however, of a patch *without manure*, we are unable to see what was the positive effect of each; hence we cannot say whether the equal yield from each plot arises from the *equal working* of the manures or from the *total failure* of both.

2°. That salt applied by drill, along with rape-dust, produces somewhat similar, though not so decided effects, as when applied as a top-dressing auxiliary to rape-dust. Thus we have, in No. 2, the *highest yield* of grain and the *lowest* of straw, al he heaviest weight per bushel of grain.

VI.—Experiments on Wheat.

M.—Experiment on the actual and comparative effects upon the Wheat crop, of Nitrate of Soda, Nitrate of Potash, Sulphate of Soda, Soot, and Salt.

Details.—Soil—moderate limestone, worth 24s. per acre. Prior crops—*turnips*, (manured;) *barley*, (rape-dusted;) *seeds*, (pastured with sheep.)

Management.—Sown with red wheat November 7, 1841, and top-dressed as follows:—

Soot. 5.	Common Salt. 6.
Nothing. 3.	Sulphate of Soda. 4.
Nitrate of Soda 1.	Nitrate of Potash. 2.

No. 1.	¼ acre	Nitrate of soda,	2½ stones,	applied as a top-dressing,	May 2, 1842.
2.	do.	Nitrate of potash,	2 stones,	do.	do.	do.
3.	do.	Nothing.				
4.	do.	Sulphate of soda,	2½ stones,	do.	do.	do.
5.	do.	Soot,	8 bushels,	do.	do.	do.
6.	do.	Salt,	6 stones,	do.	do.	do.

Observations.—Showers coming after the applications were made, Nos. 1 and 2 began to shew the effects of the nitrates in a few days; in a fortnight, however, they assumed a rich dark green hue, very different from any other portion of the field.

In the course of a month after the top-dressings were applied, No. 5 (soot) also assumed a darker colour than the rest, but was not so flourishing as Nos. 1 and 2.

When reaped, (August 18, 1842,) Nos. 1 and 2 were much the best crop to the eye,—the rest being nearly equal. The straw and stubble upon No. 5 were quite blanched.

When thrashed, the following was the produce of each plot:—

No. 1.	152	sheaves yielding	734	lbs. straw and	562	lbs. grain, weighing	64	lbs. p. bush.
2.	146	do	707	do	540	do	64	do
3.	118	do	628	do	472	do	64	do
4.	124	do	635	do	459	do	64	do
5.	122	do	645	do	508	do	64	do
6.	132	do	604	do	495	do	64½	do

From the foregoing data we obtain the following

Final Results per Imperial Acre.

No.	Manure.	Quantity.	Gross Produce. Grain.	Gross Produce. Straw.	Cost of Manure.	* Increase or † Decrease. Grain.	* Increase or † Decrease. Straw.	Weight per Bushel.
			Bush.	St. Lb.	L. s. d.	Bushels.	St. Lb.	Lbs.
1	Nit. of soda	1¼ cwt.	35.125	209 10	1 9 4½	*5.62	*30 4	64
2	Nit. of potash	1 cwt.	33.75	202 0	1 17 0	*4.25	*22 8	64
3	Nothing		29.5	179 6	...	...	...	64
4	Sulph. of soda	1¼ cwt.	28.68	181 6	0 11 10½	† .82	* 2 0	64
5	Soot .	32 bush.	31.75	184 4	0 16 0	*2.25	* 4 12	64
6	Salt .	3 cwt.	30.9	172 8	0 9 0	*1.4	† 6 12	64½

Conclusions.—It will be here observed that—

1°. Nitrate of soda, nitrate of potash, and soot, have a tendency to increase the produce of wheat, both straw and grain.

2°. That common salt has a slight tendency to increase the produce of grain, and to decrease the *weight* of straw, (mark, the *weight of straw*, as it will be observed—*vide* number of sheaves per rood—that it does not diminish the bulk,) and that common salt increases the weight per bushel of the grain; thence it may, from these properties, be advantageously used as an auxiliary to other manures.

3°. That sulphate of soda has *no* visible effects upon the wheat crop. The slight variation in yield of straw and grain may be fairly attributed to accidental circumstances, such as variation of soil, &c., as no two patches can be *perfectly* equal in every respect.

N.—Experiment on the actual and comparative effects upon the Wheat crop, of Bones dissolved in Sulphuric Acid, Ammoniacal Liquid, Nitrate of Soda, Nitrate of Soda and Sulphate of Soda, (mixed,) Sulphate of Magnesia, and Common Salt.

Details.—Soil—moderate limestone, worth 20s. per acre; perfectly level, and free from all local prejudicial influences. Prior crops—*turnips*, (manured, and eaten on land, with hay, &c.,) *barley*, (rape-dust,) *seeds*, (pastured.)

Management.—Ribbed and sown, Nov. 10, 1842, with yellow chaff-wheat. Manures applied as follows:—

1.	2.	3.	4.	5.	6.	7.
Dissolved Bones.	Ammoniacal Liquid.	Nothing.	Nit. & Sulp. of Soda.	Sulphate of Magnesia.	Nit. of Soda.	Salt.

1.	¼ acre,	Bones dissolved, viz.	Bones, 84 lbs. Acid, 42 Water, 126	Mixed with 50 times weight of water, and applied as a top-dressing, April 29, 1843.
2.	do.	Ammoniacal Liquid,	40 gallons,	Diluted with 500 gallons of water, and applied as a top-dressing, April 29, 1843.
3.	do.	Nothing.		
4.	do.	Nitrate of Soda, Sulphate of Soda,	2 stones, do.	Mixed and used as a top-dressing, April 29.
5.	do.	Sulphate of Magnesia,	4 do.	do. do.
6.	do.	Nitrate of Soda,	3 do.	do. do.
7.	do.	Common Salt,	6 do.	do. do.

Observations.—The whole of this field being in excellent condition for a crop, it was deemed unnecessary to use rape-dust, or any other tillage, along with the seed. I was, therefore, fully prepared to anticipate no very striking results from the application made at spring, as the full force of a manure can be best seen when the soil actually requires it for the purposes of the next crop. At the same time, though the effects of the manures might not be so marked as in some cases, the experiment, I was aware, would be equally interesting, as it would serve to shew the effects of the various substances, as *extra* fertilizers, upon a soil deemed capable of producing a good crop without any application.

Although the whole of the plots looked well, in the course of three weeks the colour of the nitrated plots grew much darker; and, in the course of a few day's more, No. 2 (ammoniacal liquid) assumed the same hue. By the commencement of July, No. 2 had assumed a decided lead, being much the best, as far as luxu-

riance of vegetation went; the nitrated portions also looked very vigorous, being superior to all the other plots. These were much alike. By August 1st, all the plots, except those nitrated, (Nos. 6 and 4,) and No. 2, were nearly ready for the sickle. No. 2 was now a beautiful patch, and so much superior to the rest—all of which were, *considering the soil, good*—that the first inquiry of every observer was—*What tillage* was used upon it?

Nos. 1, 3, 5, and 7 were reaped August 24; Nos. 6 and 4 on the 24th; and No. 2, which retained its verdure longer than the rest, on the 26th of the same month. The produce of each plot, after being well fielded, (for which the unusually fine harvest afforded every opportunity,) was thrashed September 5, with the following results:—

							lbs. per bush.
No. 1.	136 sheaves, yielding	702 lbs. of straw, and		540 lbs. of grain, weighing			64$\frac{3}{4}$
2.	161	do.	964	do.	616	do.	64$\frac{1}{4}$
3.	134	do.	690	do.	502	do.	64$\frac{1}{4}$
4.	138	do.	828	do.	553	do.	64$\frac{1}{4}$
5.	133	do.	684	do.	515	do.	64$\frac{1}{4}$
6.	135	do.	852	do.	566	do.	64$\frac{1}{4}$
7.	129	do.	612	do.	509	do.	64$\frac{1}{2}$

From the above data we calculate the annexed table of the

Final Results per Imperial Acre.

No.	Manure.	Quantity.	Gross Produce.			Cost of Manure.			* Increase or † Decrease of			Weight per Bush
			Grain.	Straw.					Grain.	Straw.		
			Bushels.	st.	lbs.	£	s.	d.	Bushels.	st.	lbs.	lbs.
1	Dissolved Bones	8 bush., and 168 lbs. acid	33.35	200	8	1	19	0	*2.1	*3	6	64$\frac{3}{4}$
2	Ammoniacal Liquid	160 gallons	38.35	275	6	1	13	4	*7.1	*78	4	64$\frac{1}{4}$
3	Nothing		31.25	197	2							64$\frac{1}{4}$
4	Nit. and Sul. Soda	1 cwt. each.	34.42	236	8	1	10	6	*3.17	*39	6	64$\frac{1}{4}$
5	Sulphate of Magnesia	2 cwt.	32.06	195	6	0	17	0	*0.81	†1	10	64$\frac{1}{4}$
6	Nitrate of Soda	1$\frac{1}{2}$ cwt.	35.29	243	6	1	11	6	*4.04	*46	4	64$\frac{1}{4}$
7	Common Salt	3 cwt.	31.56	174	12	0	9	0	*0.31	†22	4	64$\frac{1}{2}$

Conclusions.—We here observe, upon soil in good condition—

1°. That ammoniacal liquid has *an astonishing tendency* to increase the produce of wheat.

2°. That nitrate of soda increases the produce of wheat, and that, by being mixed with sulphate of soda, its tendency to promote the growth is diminished—one cwt. of sulphate of soda failing to supply the place of one-half cwt. of nitrate, (*vide* Nos. 4 and 6.)

3°. That sulphate of magnesia and common salt produce no

very marked effects on the yield of grain, (the slight variation in the produce of Nos. 5, 7, and 3 being caused probably by the difference of soil, &c.)

4°. That dissolved bones increase the production of grain more than that of straw, and also increase the weight per bushel of the grain.

5°. That common salt diminishes the *weight* of straw more than the bulk, renders it white and brittle, and improves the weight of the sample of grain.

6°. That the gas liquid has the same effect upon the green plant as the nitrates, viz., renders the colour darker and retards the process of ripening.

O.—Experiment on the actual and comparative effects upon Wheat crop, grown on pea-stubble, of Potter's Guano, Natural Guano, Rape-dust, as a winter application; also on the effect of Nitrate of Soda as a Top-dressing for spring-sick Wheat.

Details.—Soil—very poor limestone, worth 12s. per acre. Prior crops—*Swede turnips*, (manure;) *barley*, (rape dust;) *pease*, (manure.) At the opposite end of this field the experiment P. on pease was made in 1842; the soil at that end, however, is of much better quality (*vide* samples) than this now experimented on.

Management.—Ribbed and sown with yellow chaff-wheat, Nov. 10, and manured as follows:—

Section 1.				Section 2.
1.	2.	3.	4.	5.
Potter's Guano.	Guano.	Nothing.	Rape Dust.	Rape-dust & Nit. of Soda

Sect. 1.	1. ½ acre,	Potter's Guano, ½ cwt., sown in the furrow with the seed, November 10.				
	2. do	Natural Guano, ½ cwt.,	do.	do.	do.
	3. do.	Nothing.			
	4. do.	Rape-dust, 3 bushels	do.	do.	do.
Sect. 2.	5. do.	Rape-dust, 3 bushels,	do.	do.	do.
		Nitrate of soda, 2 stones, applied as a top-dressing upon a plot which was perishing at spring, applied May 16.			

Observations.—During winter all the plots looked well—better, indeed, than the wheat upon clover lea, (Experiment N)—the fine tilth of the stubble land promoting the quick growth of the plant. At the end of April, however, symptoms of a falling off began to shew themselves, and, by the middle of May, Nos. 1 and 4 looked very sickly and patchy; No. 3 was more backward, but still was more healthy in colour, than Nos. 1 or 4;

No. 2 was as yet pretty good, the colour being still fresh. At this time another rood was measured off, (alongside No. 4,) which looked so yellow and sickly that it seemed scarcely a skeleton of a crop, and was, as an additional experiment, dressed with ¼ cwt. of nitrate of soda; this plot, be it remembered, was manured with rape-dust, same as No. 4, and the remainder of the field, (with exception of Nos. 1, 2, and 3,) at the time the seed was sown; the nitrate being now used as a medicine intended to stimulate the failing plant.

The effect of this application was magical. In ten days the yellow patches were lost, and, in a week more, the only trace to be found of them was in the increased luxuriance of the same places, the tillage being applied most liberally on the diseased spots.

Seeing this, the sickly patches throughout the whole field were now top-dressed, not as an experiment, but for the benefit of the crop. The results were equally astonishing with those upon No. 5; the worst places in the field soon being distinguishable as the best. Indeed, those who ran could read, and I had, in no few cases, to explain how the marvel had been accomplished; few imagining that, a short time before, these were actually the *worst parts* of the field, the question generally asked being, *why* they were *now* so *decidedly the best.*

During this time, the plots Nos. 1, 3, and 4, had improved a little; No. 2 was, however, decidedly best; but No. 5 had made most progress. In five weeks from the application of the nitrate, the wheat was full six inches higher, much thicker, and more luxuriant in colour than No. 4. All marks were, therefore, unnecessary; setting aside the distinction in the hue, there was a perfect ridge or step formed by the superior height of the straw in No. 5, which was a sufficient line of demarcation. The ears put forth on No. 5 were also much larger than those on the unnitrated portions.

A talented chemist, who viewed the crop at this time, called the experiment a perfect illustration of *agricultural pharmacy.* Although, however, a tonic or an aperient may act upon the digestive organs so as, in many cases, to improve health—though a stimulant may excite the languid nerves or a bitter rally the sickly appetite, they cannot in all cases succeed, nor can they remove organic infirmities; so, in this case, when harvest came, many of the ears on No. 5 were blighted. On the unnitrated portions, especially No. 4, these were, however, still more numerous.

At this time, in Section 1, No. 3 (Guano) looked decidedly *best*, Nos. 1, 3, and 4 being all bad.

August 18.—The various plots were mown, and, after standing in the field till perfectly dry, were thrashed, with the following results:—

				lbs.			lbs.				lbs.	
1.	gave	110	sheaves,	yielding 415	of straw	and	234	of grain,	weighing		$62\frac{1}{2}$	p. bush.
2.	do	114	do	do 518	do		308	do	do		$62\frac{1}{2}$	do
3.	do	132	do	do 427	do		244	do	do		$62\frac{1}{2}$	do
4.	do	124	do	do 439	do		230	do	do		62	do
5.	do	170	do	do 523	do		320	do	do		62	do

Here we have the following

Final Results per Imperial Acre.

No.	Manure.	Quantity.	Gross Produce.			Cost of Manure.			* Increase or † Decrease.		
			Grain.	Straw.‡					Grain.	Straw.	
			Bush.	St.	lb.	L.	s.	d.	Bush.	St.	lb.
1	Potter's guano,	2 cwt.	14.97	118	8	2	0	0	†0.64	3	6
2	Natural guano,	2 cwt.	19.71	148	0	1	6	0	*4.10	26	0
3	Nothing.		15.61	122	0						
4	Rape-dust,	12 bush	14.83	125	0	1	7	9	†0.78	*3	0
5	Rape-dust, and Nit. of soda,	12 bush, 1 cwt.	20.64	149	6	Extra cost. 1	1	0	*5.81	*24	6‡

‡ Be it observed that this is the gain arising from the *extra* top-dressing, and is obtained by comparing No. 5 with No. 4, where no top-dressing was used, both having had the same rape-dust.

Conclusions.—From the above we see—

1°. That winter manuring is, generally speaking, injudicious for a wheat crop on pea stubble, as it induces an *early growth*, but does not *maintain* it. The fine state of division in which the soil is after a stubble crop, the consequent facility with which the plant finds the nutritive matter which is in the soil, and the free access which the atmosphere has to the roots of the plant, (causing the ammonia in the soil to be so readily evolved,) may, perhaps, explain the *proud* growth of the plant in its early stages; while this quick escape, or use, of the tillage in the soil—leaving little food for the summer feeding of the plant when it requires most, and when the very luxuriance of foliage calls for a greater supply than if it had not grown so quickly at first—may explain the gradual falling off in the crop, after the winds and rains of spring, and the sun of summer, have exercised their influence on the soil. Again, the natural aversion which the wheat plant has to a light porous soil, and the greater danger which, in such cases—and especially when it has put out such a flush of foliage at first—it suffers from winds, &c., causing damage to the root or the stem, may also have some effect in producing the results spoken of. These remarks, however, be it remembered, relate only to *thin or light soils.* The stiff texture of strong lands prevents the evils we speak of; and, even on light land, it is only upon stubble that the evil is common; for on clover lea the arti-

ficial compression caused by pasturing the crop, leaves the soil in such a mechanical condition, that it acts as a *safe storehouse* for the manure in it, (being less penetrable by the atmosphere or rain,) and as a better support for the root and the stem. In such case, too, the less ready supply of manure, and the less free medium for the roots to spread in, prevent that overgrowth at first which requires afterwards such an extra supply of food, and such an extra mechanical support against winds and storms. At the same time, the roughness and firmness of soil which prevent *early* waste of tillage, provide for and encourage its use at a later and more important season; thus the clods, (*which the farmer takes care to preserve* in preparing the soil,) after having endured the action of winter frosts and spring showers, gradually fall to pieces, and convey *fresh soil* and *fresh food* to the roots of the plant.

2°. That guano is superior to rape-dust and artificial guano as a winter tillage on the pea-stubble wheat crop.

3°. That nitrate of soda may be applied with the greatest success as a top-dressing for winter wheat, which may at spring not answer our expectations.

The whole field, as well as the experimental plot, was an example of the truth of this. In every spot where nitrate was applied, its results were, to the harvest, most palpably beneficial —in some cases to a greater extent than the preceding details shew. This is one instance of experimental knowledge applied to immediate practical utility; and, in evidence of its success, I may add that it is the opinion of some farmers of no mean standing, who saw the working of the experiment, that it justifies us in concluding, 1st, That, in *all cases*, it is injudicious to use manure with winter crops upon stubble *until spring;* and, 2d, That, by the aid of nitrate of soda, the farmer has a *perfect command* of the straw (and hence a high probability of grain in proportion) of his crops.

VII.—Experiments on Pease.

P.—Experiment on the actual and comparative effects upon the Pea crop, of Nitrate of Soda, Sulphate of Soda, Gypsum, and extra Farm Manure as *auxiliaries to Farm-yard Manure.*

Details.—Soil—thin limestone, worth 16s. per acre. Prior crops—*wheat*, (rape-dust,) *Swede turnips*, (manure,) *barley*, (rape-dust.)

Management.—Ribbed, and sown with the partridge pea as a change for clover seeds. Manured with 4 loads of farm-yard manure per acre, and the extra applications made as follows :—

1.	2.	3.	4.	5.
Nit. of Soda. Sulp. of Soda.	Gypsum.	Nothing.	Sulph. of Soda.	Extra Manure.

No. 1. ¼ acre. { Nit. of soda 1 st. / Sul. of soda 2 st. } mixed and applied as a top-dressing, May 10, 1842.
2. do. Gypsum, 1 cwt. do. do.
3. do. Nothing.
4. do. Sulph. soda ½ cwt. do. do.
5. do. 1 load of extra manure, spread on the soil before sowing the seed.

Observations.—No. 5 had the lead before top-dressings were put on; after this, however, No. 1 soon came up with it. No. 2 also began to exhibit signs of luxuriance soon after.

At flowering time, No. 4 had the lead, being more advanced in growth, though not so long in straw as the rest. At harvest, Nos. 1 and 5 stood first in weight and strength of straw, and No. 4 as respected corn, *every stem being loaded with pods.* No. 2 was not quite so full of straw as Nos. 1 and 5, nor so full of corn as No. 4. No calculation as to the yield could be formed; for No. 3, though short in the straw, was very well podded.

August 15.—The plots were reaped, and on the 26th were thrashed with the following results:—

No. 1.	216 sheaves, yield.	918 lb. of straw, and	729 lb. of gr., weigh.	61 lb. per. bu.				
2.	210	do	892	do	787	do	61	
3.	192	do	720	do	636	do	61	
4.	186	do	786	do	778	do	61	
5.	212	do	896	do	630	do	61	

Hence we have the following

Final Results per Imperial Acre.

No.	Manure.	Quantity.	Gross Produce.		Cost of Tillage.			* Increase or † Decrease of		Weight per Bushel.
			Grain.	Straw.	L.	s.	d.	Grain.	Straw.	
			bush.							
1.	Nit. and sul. soda.........	½ cwt: and 1 cwt.	47.8	262.4	1	1	3	*6.1	*55.8	61
2.	Gypsum.......	4 cwt.	51.6	254.12	0	12	0	*9.9	*49.2	61
3.	Nothing.......	...	41.7	205.10		...				...
4.	Sulph. soda...	2 cwt.	51.01	224.8	0	19	0	*9.3	*18.12	61
5.	Extra manure.	4 loads.	41.3	256.0	1	4	0	† .4	*50.4	61

No difference was perceptible in any of the samples.

Conclusions.—In this case we see—

1°. That nitrate of soda, sulphate of soda, and gypsum, may be used with beneficial effect upon the pea crop.

2°. That nitrate of soda, *as an auxiliary to manure*, increases

the straw in a greater ratio than the grain—that sulphate of soda increases the grain in a greater ratio than the straw—and that gypsum increases both in nearly an equal ratio; thus the undressed plot gives about 1 bush. of grain to 69 lb. of straw,

while nitrate and sulphate of soda (No. 1) give an increase of 6.1 bush. of grain and 55 st. 8 lb. of straw, being	1 bush.	do.	to $127\frac{1}{2}$ lb.	of straw.
Sulphate of soda—a gain of 9.3 bush. of grain and 18 st. 12 lb. straw, being	1 bush.	do.	to $26\frac{1}{2}$ lb.	do.
And gypsum, an increase of 9.9 bush. of grain and 49 st. 2 lb. of straw, being	1 bush.	do.	to $69\frac{1}{2}$ lb.	do.

3°. That a *large* application of farm-yard manure for pease is injudicious, as it increases the straw but not the grain. We have a gain of 50 st. 4 lbs. of straw, and a loss of $\frac{4}{10}$ths of a bushel of grain; this trifling loss, however, may be considered as one arising merely from accidental circumstances.

Another experiment on pease, made during the present year, (1843,) with guano and farm-yard manure, (1 cwt. of guano on $\frac{1}{2}$ an acre, and 9 loads of manure on $1\frac{1}{2}$ acre,) I have not recorded—no difference being perceptible between the two applications. The result on each patch was as good as could be wished for—the particulars of each I have not ascertained.

VIII.—Experiments on Meadow Grass.

Q.—Experiment on the actual and comparative effects upon Meadow-grass of Nitrate of Soda, Sulphate of Soda, and Salt.

Details.—Soil—good sandy loam, upon subsoil of gravel, perfectly dry, and in good condition; mown annually and manured occasionally; worth 50s. per acre per annum.

Management.—Tillages applied as follows:—

1.	2.	3.	4.
Nit. of Soda.	Sul. of Soda.	Nothing.	Salt.

No. 1.	$\frac{1}{4}$ acre,	Nit. Soda, 2 stones, applied as a top-dressing,	May 4, 1842.		
2.	do.	Sul. Soda, 3 stones,	do.	do.	do.
3.	do.				
4.	do.	Common Salt, 1 cwt.	do.	do.	do.

Observations.—The effects of the *nitrate of soda* were soon apparent, No. 1 assuming a dark-green foliage. No distinguishable effects were shewn in the other plots. No. 1 maintained a decided

superiority up to the time of mowing. The whole of the plots were cut, July 4, and the hay on each weighed, July 18, with the following results :—

No 1.	3830 lbs. of grass,	or 1228 lbs.	hay,	when stacked.
2.	2672	do	931	do	do
3.	2768	do	973	do	do
4.	2838	do	1044	do	do

From which we get the following

Final Results per Imperial Acre.

No.	Manure.	Quantity.	Gross Produce. Grass.	Gross Produce. Hay.	Cost of Tillage.	*Increase or †Decrease of Hay.	Hay in 100 lbs. of Grass.
			St. lbs.	St. lbs.	L. s. d.	St lbs.	lbs
1.	Nitrate of Soda, .	1 cwt.	1094 4	350 12	1 3 6	*72 12	32.06
2.	Sulphate of Soda, .	1½ cwt.	763 6	266 0	0 13 9	†12 0	34.8
3.	Nothing, . . .	...	790 12	278 0	...	...	35.1
4.	Common Salt, .	3 cwt.	810 12	298 4	0 9 0	*20 4	36.78

Conclusions.—In this experiment we learn—

1°. That nitrate of soda increases the produce of grass in a greater proportion than that of hay.

2°. That sulphate of soda has no visible effect upon the hay or grass crop.

3°. That salt increases the per centage of hay from a given weight of grass.

R.—Experiment on the actual and comparative effects upon Meadow-grass, of Nitrate of Soda, Sulphate of Magnesia, Guano, and Potter's Guano.

Details.—Thin limestone soil, worth, if under the plough, 24s. per acre. Pastured for many years, and mown for the first time four years ago. Since then it has been manured twice, and limed once. The turf is very mossy and full of weed, being what is termed hide-bound.

Management.—Manured in three sections; one plot in each section being left without tillage, as follows :—

No. 1. ⅛ acre Nit. of Soda 1½ st., top-dressing May 10th, 1843.
2. do Nothing, do
3. do Nit. Potash, 1 st., do

4. do Sul. Soda, 2 st., do
5. do Nothing, do
6. do Sul. Magnesia, 2st., do

7. do Guano, 2 st., do
8. do Nothing, do
9. do Potter's Guano, 2 st., do

Guano. 9.	Nothing. 8.	Potter's Guano. 7.
Sul. Magnesia 6.	Nothing. 5.	Sul. Soda. 4.
Nit. Potash. 3.	Nothing. 2.	Nit. Soda. 1.

Observations.—The effects of the nitrates were visible, in a fortnight, in the increased luxuriance of the colour of the grass. In the course of a week or two more, the guanoed plot began to thrive vigorously. No. 9 also shewed some progress. Up to the time of mowing, Nos. 1, 2, and 7, maintained a decided superiority over every other—the bottom grass in each of the three being doubled in length by the application. After mowing, *the stubble appeared cleaner and more open*—the weeds, plantain leaves, &c., no longer clinging so close to the ground. The crops were mown July 18, and stacked on the 29th—

No. 1	giving	1133 lbs.	of grass, or	342 lbs.	of hay,	when ready for stack.
2	do	788	do	260	do	do
3	do	1002	do	305	do	do
4	do	724	do	253	do	do
5	do	681	do	238	do	do
6	do	672	do	235	do	do
7	do	1064	do	351	do	do
8	do	743	do	260	do	do
9	do	911	do	302	do	do

From these results we obtain the

Final Results per Imperial Acre.

No.	Manure.	Quantity.	Gross Produce. Grass.		Gross Produce. Hay.		Cost of Manure.			†Increase or *Decrease of Hay.		Hay, from 100 lbs. of Grass.
			sts.	lbs.	sts.	lbs.	£	s.	d.	sts.	lbs.	
1.	Nit. of Soda,......	1¼ cwt.	647	6	195	6	1	6	3	*46	12	30.1
2.	Nothing, ...	...	450	4	148	8		...		...		33 nearly
3.	Nit of Potash	1 cwt.	572	8	174	4	1	17	0	*25	10	30.4
4.	Sul. of Soda,.........	2 cwt.	413	10	144	8	0	19	0	*8	8	35 nerl y
5.	Nothing, ...		389	2	136	0		...		...		35 ...
6.	Sul. of Magnesia.	2 cwt.	384	0	134	4	0	17	0	†1	10	35 ...
7.	Guano,...............	2 cwt.	608	0	200	8	1	6	0	*52	0	33 ...
8.	Nothing, ...	...	424	8	148	8		...		...		35 ...
9.	Potter's Guano, ...	2 cwt.	520	8	172	8	2	0	0	*24	0	33.15

It will be observed that the increase or decrease in the produce of each plot is obtained by comparing the gross produce of that plot with the gross produce of the *unmanured portion in the same section.*

Conclusions.—From the above we learn—

1°. That nitrate of soda, nitrate of potash, guano, and Potter's guano, increase the produce of grass and hay, and that they all have a tendency to diminish the per centage of hay obtained from a certain quantity of grass. (The aftermath afterwards shewed a continuance of the beneficial effects.)

2°. That sulphate of soda and sulphate of magnesia have no visible beneficial effects upon the hay crop.

ON THE FEEDING OF FARM HORSES.

By Mr Charles Stevenson, Redside, near North Berwick.

[Premium, Ten Sovereigns.]

I.—The question, still undecided, as to the best mode of feeding horses employed for agricultural purposes, is one of much moment to the farmer, and is not without even a national interest. How is the horse to be maintained in his most *efficient state*, and at the *least expense to his owner?* This, in fact, is the whole question—a question not limited to the mere farming class, and if the statistics of M'Culloch and of others be trustworthy, is in some measure worthy of being considered national; for if we consider the extent of land under cultivation in Great Britain and Ireland to be 48,000,000 of acres, and that for the due cultivation of every 25 acres the whole labour of one horse is required, whilst for each acre so cultivated the horse will consume as food annually about 200 stones weight of grain, thus about 1,920,000 of horses are consequently required for the due cultivation of that extent of soil, and the amount of grain annually consumed by these horses will be 28,571,428 quarters, assuming the weight of each bushel to be 42 lb. M'Culloch states the number of horses to be 1,600,000. If we allow a proportion of the land to be cultivated with the spade in Ireland, and a part in England by oxen, this will reduce the number of horses employed in agriculture; still I suspect that the number of horses is greater than stated; for the employing of three, four, and five horses in the plough (a good deal practised in England) will tend much to increase the number required to cultivate the soil.

In order rightly to consider this important question it is safest perhaps to view the horse "as the moving power of the farm;" and, like every engine of force, must and ought to be maintained in a condition fully equal, if not *superior*, to the labour demanded. As a living engine, he ought, if possible, to be kept "above his work," a pithy but very intelligible phrase, well understood by those familiar with the horse. It seems almost unnecessary to use many arguments in support of this maxim. The employment of horses weakly as to health and low as to condition must of necessity lead to a diminution both of labour and produce; when once in good condition, he is, of course, more easily kept up to it.* This is a fact well known to all feeders of horses; besides, the weight of the plough *in motion* must be greater to the ill-conditioned, feeble horse, than to the active, high-fed animal, whose

* This law holds throughout the whole animal kingdom, and more especially in man.

motions, being more rapid, gives to the plough a speed contributing greatly, by a diminution of friction, to a diminution of the actual resistance to be overcome. But this principle requires no illustration from me.* Having alluded to it, however, I shall take the liberty of suggesting, for the consideration of Scottish agriculturists, the superiority of the Cleveland breed of horses to those now employed; or, at least, the superiority of horses the produce of a first-rate blood-horse (such as Charles XII.) and a good Clydesdale mare, over any of the breeds now used in Scotland. Horses of this description, I have every reason to believe, are longer lived than the mere cart or draught horse—they are more energetic when old, are less liable to disease, and they have the valuable quality of speed without distress. All that can be requisite for a draught horse, in addition to the properties of the Arab or blood horse, are temper and weight.† This improvement in our breed of draught horses would, however, require considerable improvements in the construction of farm implements in general.

II.—None of the horses subjected to experimental feeding were exposed to any violent or sudden change in their mode of feeding, with the exception of those fed on boiled turnips. The previous mode of feeding was as follows:—

1. Two (5 lbs.) feeds of bruised oats, with a few beans daily. 2. One feed of a mixture of all the light grains, with a few turnips and chaff, boiled at night. 3. Raw Swedish turnip, *ad libitum*. This was the diet until spring labour commenced. The quantity was then increased to

Five feeds, of 5 lb. each, about - -		25 lb.
Or four feeds, of 5 lb. each, - -	20	} 24
With 4 lb. of linseed cake, - -	4	

The use of the linseed cake seemed to improve their coats; and I can with confidence recommend it to the farmer.‡

Notwithstanding the amount of grain employed in the above

* See experiments on the draught of the plough by Pusey and others, published in the English Agricultural Journal. I have also tested the accuracy of these experiments in respect to the harrow. The execution of the harrow (the most of farmers are aware) is in ratio to the speed with which it is moved.

† I am aware that strong and decided prejudices exist upon this point. These prejudices, however, I consider to have arisen almost entirely from breeders of horses selecting diseased thorough-breds, which for breeding for the turf or field are thought useless. Such horses being obtained for a trifle, and bred from, breeders from such brutes, overlooking the golden axiom, "*that like will produce like*" *throughout the whole animal kingdom*, not only entail a curse upon themselves, but perpetuate an injury to the public, by the food which such stock uselessly consume, without yielding an adequate return. Perhaps upon no subject could the funds of the society be better expended than in *obtaining* and *disseminating information* on *the breeding* and *rearing of horses*, as it is notorious to the frequenters of horse markets that our breeds of draught horses are fast deteriorating.

‡ Mr Johnston (Elements of Agricultural Chemistry) states "that three stones of oilcake will nourish an animal as much as ten stones of hay, and five stones of

mode of feeding horses—and which, to the farmer of a friable soil, will, no doubt, appear extravagantly large—such is the stiffness of the red clay soil of my farm, that the horses are generally towards the close of the turnip season quite knocked up. The draught of the plough, in fact, when tested by the dynanometer, marks from seven to twelve cwt., being more than double what it has been found to be on average soils. Under such labour the horse in a few years looks old and worn out.

The following were the different modes of feeding during the experimental inquiry.—

1. The fodder, during winter, was wheat straw.

2. During spring, bean straw. None of the straw was chopped or cut. Having, a few years ago, obtained rather an expensive straw-cutter, upon trial it was found to require more labour than could counterbalance any advantage that could be derived from it. Perhaps, where a number of horses and young cattle are kept, it might be an advantage to have a straw-cutter attached to the thrashing-machine. There appears to me to be one great disadvantage of cutting hay and straw: that the horse is in this manner compelled to eat what he otherwise would reject as injurious, and which he would have carefully avoided had the fodder been given uncut. Here I may remark of fodder in general, that hay is the best fodder for the horse, and its *nutritive qualities* are seldom sufficiently valued by the farmer; next to it is bean straw, when well got, but it is dangerous to the horse when given *damp*; next is wheat straw, then oat straw. Barley straw should never be given to the horse if possible; straw of the chevalier variety, however, is less objectionable, and I have observed the horse rather partial to it.

The grain they were fed upon was as follows:—

1. Three horses fed on bruised oats (15 lbs. daily) with 42 lbs. Swedish turnip, also daily.

2. Two horses fed on a mixture of bruised grain, of which two parts were oats and one part barley, and one part beans; also Swedish turnip, 42 lbs. daily.

3. Three horses fed on the same mixture as the above, two feeds given raw, and one feed boiled; of course the boiled portion unbruised—these horses had also 42 lbs. Swedish turnips daily.

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oats as much as either." In a paper submitted to the French Academy in August last, by M. C. D'Ossigny, on the fattening of cattle, he states that "with equal weights of dry substances, different sorts of food, though of equally good quality, have very different effects; the *cakes* of oleaginous grains are the best; they are four times more nourishing than hay or lucern, and double more or less than the leguminous grains," &c. These estimates are, perhaps, rather high, but I consider it highly beneficial to the over-fed horse, first, for variety, second, for the powerful effect it exercises on the skins of all animals; and the skin of the horse generally indicates pretty correctly the state of his health.

4. Two horses fed on the same mixture, all boiled, with 42 lbs. boiled Swedish turnips daily.

5. Two horses fed on boiled Swedish turnips, with one feed of 5 lbs. of the bruised mixture daily. These horses consumed about 150 lbs. daily, each horse, of the Swedish turnips.

Mr Cowie, in his report, has pointed out the advantages of bruising; this I also ascertained by experiments, undertaken for my own information, some years ago, therefore none of the horses experimented upon were fed on unbruised grain.

The experiments commenced in November, and were continued throughout with one interruption. This interruption was caused by the giving way of the cast-iron boiler; for this, one of malleable iron was substituted, and was found to answer much better, requiring decidedly less fuel The horses were all in very low condition, from having been wrought on very stiff bean land. When the experiments commenced, the weighing-machine was not quite ready for use, but the horses were all carefully measured by girthing, which indicates pretty correctly any variations in the condition of cattle and horses. During winter, the labour being well advanced, and the season being comparatively a dry one, the land was thus somewhat more easily wrought; thus the horses passed a good deal of time in the stable: since March, however, they have been constantly wrought, wet days excepted.

III. The horse marked No. 2 in the following table is slightly spavined; all the rest are good sound horses. Three are half-bred—viz., Nos. 3, 9, and 10. No. 5 has a little breeding: they were all purchased, with one exception, in the west of Scotland.

The annexed tabular view shews the age, girth, and weight, ascertained at different periods, generally on the evenings of Saturday, after unyoking. The two last columns but one shew the weight on the Monday morning of the 21st April, before and after being fed and watered. The greatly increased weight of those fed on the boiled turnip is worthy of notice, their weights, since the Saturday night, having increased, one 6½ stones before feeding, after feeding, 8 stones; the other one 7½ stones before feeding, after feeding, 8½ stones.

The last column shews the girths and weights of the horses on the 3d August. The weights were taken at that date with a view to test the soundness of an opinion generally entertained by those farmers who are advocates for what they style "hard feeding"—(viz., feeding on dry corn)—that horses kept on boiled food do not keep their condition so well at grass as those fed on raw grain. Nos. 2, 9, and 10, from being quarrelsome, were soiled in the stable, the rest were at pasture. Nos. 2, 9, and 10, from being at hand, were oftener in the yoke. Those *not marked* in the table had been previously sold.

The different kinds of Food Experimented with.	No.	Age.	Nov.	March 11.		April 15.		April 22.		April 29.		May 1	May 6.		May 13.		May 20.		April 21.		August 3.	
			Girth.	Girth.	Wt.	Girth.	Wt.	Girth.	Wt.	Girth.	Wt.	Additional Food.	Girth.	Wt.	Girth.	Wt.	Girth.	Wt.	Weights.		Girth.	Wt.
			Ft. In.	Ft. In.	Stones.	Ft. In.	Stones.	Ft. In.	Stones.	Ft. In.	Stones.		Ft. In.	Stones.	Ft. In.	Stones.	Ft. In.	Stones.	Stones.	Stones.	Ft. In.	Stones.
1. Three fed on bruised oats, (15 lbs.,) with 42 lbs. of Swedish turnip daily given, all raw.	1	5	6 6	6 9	120	6 8	116	6 7	115	6 6	115	The turnips being all consumed, they got 4 lbs. of cakes as a substitute; also 5 lbs. of oats.	6 6	115½	6 6	115	6 6	114	116½	117½	6 7½	124
	2	11	6 6	6 2	96	6 1½	95½	6 0½	91¼	6 1	93		6 1	92	6 1	94	6 1½	95½	93	94	6 2	95½
	3	6	5 6	6 1	81	6 0	76½	5 10½	72¾	5 11	74		5 10½	75	5 10½	76	5 11	77	75	76½	sold.	...
2. Two on a mixture of different grains, with 42 lbs. Swedes, all raw (given 15 lbs. daily.)	4	8	6 4	6 5	105	6 5½	105½	6 4½	102	6 3½	100	Mixture, 5 lbs. additional; also 4 lbs. of cakes.	6 4	104	6 4	103½	6 3½	101	103½	104	6 4	105
	5	7	6 1½	6 4	101	6 3½	97½	6* 3½	96	6 3½	97		6 3½	95	6 3½	96	6 3½	96	95	96	6 5	103½
3. Three on the above mixture, one feed boiled, two given raw, 15 lbs. daily, with 42 lbs. Swedes.	6	16	6 3	6 5	92	6 5	92	6 4	91½	6 3	91½	One feed 5 lbs. additional, also 4 lbs. of cakes.	6 2¼	90½	6 3	93	sold.	...	...	...	...	...
	7	6	5 11	6 1	89½	5 11	84½	5 11	84½	6 0	87½		sold.	...	...	...	...	...	...	...	...	...
	8	4	...	...	...	6 1	90	6 0½	87½	5 11½	87½		6 0½	91	6 0	88½	6 0½	90	89	90	6 2	98
4. Two horses on the same mixture, all boiled, (15 lbs. daily,) 42 lbs. Swedes, also boiled.	9	4	5 10½	6 0	80	5 10½	76	5 10½	75	5 10	73	One feed additional raw mixture, 4 lbs. of cakes.	5 10½	77	5 10½	75	5 10½	75½	77½	79	5 9	76
	10	5	5 11½	6 2	86	6 1	84	6 0½	81	6 0½	82½		6 0	80	6 0½	84	6 0½	85½	83	84	6 2	84
5. Two fed on boiled turnips, with 5 lbs. of the bruised mixture daily.	11	4	6 2	6 5	101½	6 3½	100	6 2½	93	6 2½	97	Feed the same as Nos. 6, 7, and 8, the turnips being all consumed.	6 1½	95	6 1½	96	6 1½	96	99½	101	6 3	104
	12	5	6 0	6 4	98	6 2	95½	6 2	92	6 1½	92		6 2	96	6 2	97	6 1	95½	99½	100½	6 4	103

IV. The quantity of grain (15 lb. daily) consumed by each horse was evidently more than was requisite during the winter months for the labour performed, the girths having increased considerably. I may make a single remark in regard to No. 2. Prior to November, this mare had been used for the saddle, and kept upon hay. After being put upon straw, she consumed an increased quantity of straw: this will in part explain her increased girth; but, upon the whole, she improved more than any of the rest up to March. The girths of those fed on boiled turnips indicate the greatest improvement. The quantity of grain allowed was below what they required after March, as proved by the girthing and weights lowering in the scale. On the 1st May, as may be seen by the Table, they were allowed an extra quantity (5 lb.) of grain, which produced, however, no increase of weights in the horses. They had also, at this date, (as before mentioned,) an allowance of 4 lb. of oil-cake, the turnips being nearly all eaten up. They had the additional advantage of being a good deal in the stable, off work, owing to rainy weather, and still they did not gain in flesh. The reason I feel disposed to assign for this is, that having lost their condition upon 15 lb. of grain, it required some time before they could recover it, unless work had comparatively ceased altogether. There is one remarkable circumstance—the relative weights of the horses varied almost every time they were weighed, shewing that, although it had not excited attention, there had been some slight derangement in the state of their health.

V. Those horses which were fed on bruised oats were evidently less energetic than the others. Two of them, Nos. 1 and 2, performed less work; they were dull in the yoke, and their coats looked unhealthy. Those on raw mixed grain were the most energetic. Variety in food seems to have a beneficial effect, an opinion corroborated by the observations of Liebig and others. Those on the boiled food, whether turnip or otherwise, shewed a healthy glossy coat. Their perspiration did not seem more abundant than usual, with the exception, perhaps, of those fed on boiled turnips. Those on boiled turnips consumed more straw: they scarcely ever tasted water. By original conformation, all those on boiled food have a naturally quicker step, and thus imperceptibly, as it were, performed more labour.

VI. A glance at the Table will shew that, in one week, (from the 15th to the 22d April,) the horses fed on boiled turnips lost, on an average, each $5\frac{1}{2}$ stones weight, and one as much as 7 stones weight. On examining the food, I found that the turnips had sprouted a good deal; and conjecturing this to be the real cause of the falling off in the horses fed on these turnips, I substituted others of a better quality, supplied me by a neighbour-

ing farmer. By this change, the horses evidently gained much: they ate their food with more relish, and recovered in one week 2 stones weight each in flesh. The recovery was by no means so rapid as the decline, thus furnishing a useful hint to the feeder to be ever watchful as to the quality and quantity of the food.*

VII. In the west of Scotland, the great breeding district of the agricultural horse, and in which most of the horses brought into this country have been purchased, the boiling a part, at least, of the food of the horse, is a universal practice, so that it is not to be wondered at that, during their first season in the country, such horses should fall off—even habit and associated feelings telling against the feeding on raw or unprepared food animals so long accustomed to the opposite. But the expense of boiling is considerable. Counterbalancing this expense is the opportunity it gives of using inferior grain, not to say the mere refuse which may also be employed. This refuse of grain being often mixed up with small stones and sand, great care is required to clear it of these as far as possible. Chaff is also mixed with the seeds of weeds, which are thus, when used as food for the horse, *resown*, causing much labour and trouble to the farmer. An effectual means of destroying the vitality of these seeds whilst in the dunghill is still a desideratum.†

Another advantage is gained by the use of boiled and also bruised food. It aids the aged horse, whose masticating powers, from the decay of his teeth and strength of jaws, are constantly becoming more and more enfeebled. The effect of this on the digestive powers I need not insist on.‡

VIII. An ox of 60 imperial stones weight will consume 200 lb. of Swedish turnips daily. Now, the highest price obtained in ordinary years for cattle being 5s. per week, this leaves 8s. per ton for the turnip; but this price can scarcely ever be realized now for cattle, 3s. and 4s. being more common.

By calculating the turnip at 8s. per ton, and the different grains at the following prices at which they were bought, namely:—

* Thus it would appear that turnips, by sprouting, lose a good deal of their nutritive properties; the germination probably diminishing the quantity of starch and sugar they may contain: hence an important question arises—Do turnips not lose a part of their nutritious qualities by being allowed to shoot up a stalk either in autumn or spring; and thus may not the weight per acre prove often a fallacious test of their value?

† The fermentation of the dunghill does not in general accomplish it. Perhaps sulphuric acid might be profitably put upon the dunghill for this purpose, as well as for its effects upon vegetation in general.

‡ In bruising the grain, the cylinder is to be preferred to the millstone. Bruising cylinders cost from £10 to £15; but in the price is included the attaching them to the thrashing-mill. They do not, however, in general, bruise beans well, except when the beans are very dry.

Oats, 42 lb. per bushel,	at	17s. 6d.	per quarter.
Barley, 54 lb.	do.	19s. 6d.	do.
Beans, 64 lb.	do.	28s.	do.
Allow for bruising,		6d.	do.
Allow for boiling,	-	1½d.	per feed of 5 lb.

We have—

1. Nine months' keep on bruised oats, at 15 lb. per day, -	L.10	19	3¾
And turnip, 42 lb. per day, - - - - - -	2	11	0¼
	L.13	10	4
2. Nine months' keep on the mixture, (also bruised,) composed of two parts oats, one part barley, one part beans, amounting, at 15 lb. per day, to	L.8	17	5¼
Turnip, 42 lb. per day, - - - - -	2	11	0¼
	L.11	8	5½
3. Nine months' keep on the above mixture, two feeds, one being raw, and one boiled, - - - - - - -	L.9	7	6¼
Turnip, 42 lb. per day, - - - - -	2	11	0¼
	L.11	18	6½
4. Nine months' keep on the above mixture, all boiled, the turnips (42 lb. daily) being boiled along with the grain, amounting to	L.12	18	9
5. Nine months' keep on boiled turnips, 150 lb. per day, -	8	9	0
And one 5 lb. feed of the bruised mixture, - - -	2	19	1¾
	L.11	8	1¾

In regard to the article of cost, the results are in favour of the *boiled* turnips, with one feed of bruised grain. No. 5. Turnips, by boiling, lose 20 per cent. of their weight, and, perhaps, a part of their nutritive qualities. At the commencement of the inquiry, the turnips were washed or cleaned previous to being put into the boiler, causing much trouble and a good deal of expense. It turned out afterwards, on trial, that this procedure was unnecessary, the turnips becoming quite free of all impurities during boiling. They, however, must be removed whilst entire. The swine seemed to relish what remained in the boiler. In regard to the amount of turnips used, it will appear extravagantly large when compared with the statements on this point in Mr Cowie's report;* but, as every possible care was taken to ensure accuracy, I do not believe that the quantity has been overstated on my part. After the turnips had sprouted, it ought to be remarked that they were not eaten clean up by the horses.

IX. From November to March the horses were all in good health. No. 6, a mare, got slightly foundered about the end of March, but recovered speedily after a single dose of medicine. We attributed her ailment to a long exposure to cold and wet

* In the report alluded to, the quantity stated is 28 lb. daily of steamed turnips, and that the horses maintained their condition, and performed the work required. Now, in recurring to the Table, the reader will be pleased to observe that 150 lb. of turnips, with an addition of 5 lb. of grain, was absolutely required to effect the same object. Two very large turnips will weigh 28 lb.

in the grain market. Nos. 8 and 10 were twice attacked with spasmodic colic; the cause of this was traced to their boiled food having become *sour* before being used, but they were constitutionally liable to this complaint. No. 3 had, for a couple of weeks in April, a slight cold, brought on probably by exposure, whilst perspiring, to a current of cold air; all the rest were perfectly healthy, without ailment, and free from all galled shoulders —an unseemly injury, calculated at once to injure the *condition* of the horses and to excite well-founded suspicions of a want of attention to their comfort.

X. The situation of the stable is low and damp; the general depôt for the farm manure is in an inclosure closely adjoining the stable to the east; the windows of the stable open into this court or inclosure, across which blow those frequent easterly winds, the bane, no doubt, of this part of the country. If ammonia be, as Liebig supposes, prejudicial to the lungs of the horse, the air of a stable so situated must be constantly impregnated with it. To remedy this evil, in as far as lay in my power, I have caused the floor of the stable to be sprinkled with gypsum or quicklime.

XI. In conclusion, I may remark, that it argues a want of management or of knowledge, on the part of proprietors of horses, that these animals should become so liable to disease in the lungs after being stabled, as is reported. Mr Percivall, for example, says, that "pulmonary disorders carry off more horses than all other diseases together." It is true that this assertion stands unsupported by good statistics, on which basis alone such statements should be made, yet every farmer will bear him and me out in the assertion that pulmonary disease, in one shape or other, is very destructive to the farm horse; nor is it unusual for a farmer to be forced to re-stock his farm thrice during the currency of a nineteen years' lease. The theory of pulmonary disease is obscure, no doubt, like that of most others, but still surely something may be done by way of prevention. Sudden changes of temperature, and checked perspiration, are known to injure man; they must have much the same effect on the horse. Common prudence suggests the propriety of attending to the condition of the horse at the moment when turned out of an evening to grass; and our varying climate, added to the frequency of easterly winds, exposing horses to sources of pulmonary disease, not existing, to the same extent at least, elsewhere, ought to force on us a greater watchfulness over the comfort and safety of this eminently useful animal.*

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* The proper ventilation of stables is comparatively a new subject: in fact, the present system has no reference whatever to the breathing of the horse, exclusion

STATEMENT as to the MODE of ERECTION and TENURE of COTTAGES for LABOURERS and TRADESMEN on the Estates of Annandale, belonging to J. J. HOPE JOHNSTONE, Esq., M.P.

By CHARLES STEWART, Esq., Hillside.

ABOUT thirty years ago, the labourers and country tradesmen generally held their houses under the tenants. Having been mostly old and thatched, they had become uncomfortable, and, in many cases, from the situations being adjoining the farm-steading, were incommodious, and had to be taken down.

A new system of erecting them was adopted.

A lease of twenty-one years is given of the house-stead and large garden at a rent of 5s. yearly. The tenant erects the house

of free air being the law, its free admission the exception. The necessity of a complete revisal of the construction of stables, with reference to their proper ventilation, may be best seen by reflecting on the amount of pure air required by the horse. In none of the publications which I have consulted, could I find correct information as to the size of the lungs of the horse, or of the quality of carbonic acid gas given off by the lungs. If, however, we take the size of the lungs in man, we can thus approximate pretty nearly to it. The ordinary girth of man is a little less than three feet; the ordinary girth of a draught horse is six feet; we may, therefore, with all safety, consider the lungs of a horse at least four times the size of man's. A man inspires and expires each time about 25 cubic inches of air; a horse will, therefore, inspire and expire each time about 100 cubic inches. The inspiration of the horse I have found to be about eleven times per minute. This observation was taken at 6 o'clock A.M. There can be little doubt, however, that it varies considerabl according to circumstances. Let us, however, take eleven respirations per minute, this will make per minute, - - - 1100 cubic inches.

	60	
Per hour, - - -	66,000	
	24	
	264,000	
	132,000	
Per twenty-four hours, -	1,584,000	cubic inches.

By multiplying these cubic inches by the number of horses kept in the stable, we can then imagine what the horse suffers. In the mysterious process of respiration, a quantity of carbonic acid gas is given off by the lungs from the blood. The amount in man, according to Sir H. Davy, is 31,680 cubic inches; this multiplied by four, will make 126,720 cubic inches, the quantity given off by the horse. All this, independent of the watery vapour exhaled, and the ammonia with which every stable must in some degree be filled. The stable, then, if not thoroughly ventilated, must be constantly filled with carbonic acid gas; and did it not happen that his food abounds with carbon, his frame could not withstand the velocity of his respiration.

When we consider these tolerably well-established facts, need we be surprised when we see the horse cut down by pulmonary disease; our only wonder should be how the horse can live in the ordinary stables of this country.

at his own expense, excepting the price of timber, which is given from the estate, and hewn freestone for chimney-heads, door and window rybots, jambs, ridge-stone, &c, in all costing the proprietor from £5 to £6.

The proprietor reserves right to resume possession, or giving six months' notice at any Whitsunday, and paying the proportion of the tenant's outlay for the time unexpired of the lease, the value or outlay being fixed at the commencement at £26 : 5s., £31 : 10s., or from £35 to £40, according to the size of the house.

The smallest house is generally thirty feet long by nineteen feet wide over walls. They are all covered with Welsh slate, and lofted with Scots fir boards. The room end is also boarded, and, in most cases, the kitchen is either flagged or boarded.

The cost at the present time is—

Welsh Slates, - - - - -	£4	10	0
Mason and Slater, - - - - -	5	10	0
Joiner and windows, two in front, and one or two small ones in gable, - - - - -	7	0	0
Price of lime and other outlays, - - -	4	0	0
	£21	0	0

The other cost is confined to the tenant's own work, in raising and finding stones, which are abundant, assisting masons, and carriages, which, in most cases, they get in kindly exchange for farm work to farmers and neighbours.

The erection of these houses has been gradually going on for the last thirty years, and now reach seventy in number, in different parishes of the estate, but chiefly in the parish of Johnstone, where, from the extensive plantations and other circumstances, there is most employment for labourers.

In two-thirds or three-fourths of the cases, the tenants have, on separate leases, mostly from year to year, fields of two, three, or four acres of land, which they improve for pasture, for summering and wintering a cow, sometimes cultivating a little; and, in all cases, by the manure laid either on their own or the neighbouring farmer's ground, securing potatoes for the family, and for one or two pigs for sale. As the ground is generally coarse, and in corners not interfering with the regular inclosures for farms, the rent is low, seldom above 20s. per acre, nor, in all, above £4.

There have always been numerous applicants for every situation proposed, especially in Johnstone, where materials for building are convenient, and employment certain; but they have been cautiously granted.

None but persons of the best character, well known in the neighbourhood, and generally natives of the estate, are taken. Most of them have been ploughmen, and of good character; have saved a little money, and wish to settle, with their wives and

families; or elderly men or widows who have well-doing children, as servants, anxious and able to assist them; a few country carpenters, masons, shoemakers, &c. Great care is taken not to place any without a certain prospect of future work; and the state of the population of the parish, in reference to this, is kept strictly in view, with the intention of keeping the numbers under the demand for labour that should profitably and naturally be undertaken.

Many more such houses may still gradually be built, dependent on demand for employment in particular localities, the removal of more of the original thatched cottages, and opportunities for conveniently attaching pieces of land for cows' grass, &c. In some cases, where a deserving and suitable man is unable to undertake all the cost, assistance is given by providing slates or windows, and charging interest.

The object of the power of resumption was to check misconduct; but so little of this has occurred, that scarcely one instance has happened in which a removal has taken place on this account. Many leases have expired, and they are renewed at rents of 20s. or 25s., the tenant making farther improvements in internal comfort, slating byre, &c. They have, with little exception, shewn great industry and regularity, and there is scarcely an instance of any of the families needing parish aid. Originally of good character, exertions are made to keep permanent for the family situations where so much more security, independence, and comfort, are to be found, than where under a tenant, or in a village, or a house held from year to year.

The houses are generally on the sides of the turnpike or other public roads, detached from each other, not formed into anything like a village, a circumstance always favourable to good order and morals. Being in public view, the occupants have a strong inducement to keep them neat, whitewashed, with surrounding trees, and garden, and other appendages, in good order; and as a proof of this, for the last three years in Johnstone, and this year, 1843, in Kirkpatrick-Juxta, and Applegarth, the premiums of the Highland Society for the best kept cottages and gardens have been nearly all gained by the occupants under this tenure.

This system can, no doubt, be more easily carried into effect where the plantations of an estate afford home-timber in abundance, and also it is more applicable to proprietors of extensive estates, where in the management the proper policy is to make an annual outlay in making and keeping fences in order, draining, and other improvements, whereby a portion of the labourer's work is directly paid by himself.

From experience, it can be strongly recommended as most conducive to the comfort, independence, provident habits, and

general good conduct of the labouring classes, to the well-being of whom on his estates it is as much the duty, and will be the inclination, of the liberal and considerate landholder to attend, as to the character and prosperity of his larger tenantry.

REPORT OF CONVERTING INTO PROFITABLE TILLAGE UPWARDS OF 100 ACRES OF WASTE LAND.

By Mr Robert Elliott, Hardgrave, Ecclesfechan, Dumfriesshire.

[Premium, The Gold Medal.]

In the year 1837, I entered to the farm I now occupy, on a lease of nineteen years, its extent being 860 imperial acres—nearly one-third being waste land, the greater part of the remainder lying in a rough uncultivated state—large patches in every field, often to the extent of four or five acres together, so wet, that no attempt had ever been made to cultivate them—in other parts, so covered with heather, whins, or broom, that they were considered worthless.

In the spring of 1838, I commenced breaking up a moor, called Knockrig Moor, having first cleared the whins off it, at an expense of £28. The extent of this moor is thirty acres, and was, in general, a dry, thin soil, with a black surface, and was covered with white stones, with a red sandy subsoil. After breaking it up, I drained any spots which were wet, with drains sixteen feet apart and thirty-three inches deep, filling the drains with stones, there being, after the moor was broken up, plenty upon it for the purpose—indeed, so superabundant were they, that I carted upwards of 2,000 cart-loads off it to other parts of the farm, the abundance of the stones being the cause of my not draining the wet parts till after the moor was broken up, which, as a general rule, is not to be approved of. The way I broke up the moor was by ploughing it with a very light furrow, first burning the heather from the surface, and, after ploughing, left it till the beginning of winter, when I cross-ploughed it with as deep a furrow as I was able to get; but the soil was so thin, from turf having been regularly cast and led off it for generations, that I could not go deep. After ploughing, I broke it with heavy harrows as fine as I could, and then laid upon it 105 imperial bushels of lime per acre; immediately after which I ploughed it again, and sowed oats upon it in the spring of 1839, of which I had a good crop. Next year I sowed turnips upon it, with bones, and had an excellent crop; next year oats, and sowed it out with grass-seeds. It is at pre-

sent, 1843, a very good pasture, full of white clover. The value I put on this moor, when I took the farm, was 3s. per acre.

In 1839, I drained and broke up a great number of the waste pieces over a great part of the farm, but from their being in separate places, I cannot speak correctly as to the exact number of acres, but am certain there was more than sixty acres. These pieces had never been cultivated, and I treated them in exactly the same way as I did the moor above-mentioned, only, instead of 105 bushels, I laid only 75 bushels of lime per acre. The average value of these pieces in their uncultivated state was nearly 6s. per acre.

In the spring of 1840, I commenced to another moor, called Millstanerig Moor, extent, ninety-one acres, dividing it with thorn hedges into four fields. This was a completely waste moor, twenty-five acres of it deep moss, nearly five feet deep, which had been much broken in the surface, from peats having been taken from it, and presented a very uneven surface, large deep holes, filled with water and with high banks, and was covered with heather, reeds, rushes, water-lilies, &c., &c. The remainder of the moor was generally a thin black soil, with a yellow clayey subsoil, and was very wet; the mossy part being exceedingly level I had some difficulty in draining it. The plan I took, however, has answered the purpose completely, as carts can now travel on any part of it with a very heavy load, without even sinking. I cut a deep ditch, nine feet wide at the surface, and five feet deep, right up the middle of the moss, and by this means got to the subsoil, which was in general sand, then, at regular intervals of 100 yards, I cut main drains at nearly right angles to the ditch, and nearly the same depth; into the main drains, I cut branch drains, parallel to the ditch, and twenty feet a-part. As, however, there was a great want of fall, the plan I took to remedy it was this—I cut the branch drains at the lower end the same depth as the main drains, and tapered them gradually to the upper end, where they were only three feet deep, by which means I procured an artificial fall of two feet every hundred yards. Nearly the whole of this moor I drained with tiles, and wherever I was not able to get to the bottom of the moss, I laid a thin board below the tiles, and in some parts slates, especially where the subsoil was soft, or, what is the worse to manage, a quicksand. The whole of this moor, except some small parts which were dry, I drained with drains two and a-half feet deep and eighteen feet a-part, except the moss, which was done at twenty feet. As I finished draining the different fields in this moor I broke them up.

No. 1, twelve acres, I ploughed in November, 1840. A part of this field had, at some very distant period, been ploughed, but

was completely covered with rushes, whins, and heather. In the spring of 1841, I sowed it with oats, and had a fair crop. Next year I broke it down and planted potatoes upon it, and had, on some parts, an excellent crop, but in other parts there was a partial failure from the *taint*, some never coming up at all; but wherever they came they were excellent. This year, 1843, I have had oats upon it, which were a beautiful crop. Next year I intend taking turnips. Before sowing the last crop of oats, I laid 75 bushels of lime per acre upon it.

No. 2, eighteen acres, I ploughed up in 1841 with a light furrow; and, in the summer of 1842, wherever the moss was very deep, I burned it, cross-ploughing it after, then liming it with 75 bushels per acre. The mossy part of this field was very ill to break up; the furrow being very tough, and the horses sinking much, and often sticking altogether. About one acre had to be digged with the spade. In this field, after liming, I ploughed it again, reducing it with heavy harrows before liming. The burning assisted in breaking it down, great part of it being so tough that footballs might have been made of the turfs. In the spring of 1843, I sowed oats upon it, and have had a splendid crop, except on some parts where it was too bulky, and was laid.

No. 3, twenty-eight and a-half acres, I managed exactly the same way as No. 2, only there was more of it to dig with the spade in breaking up—fully eight acres. This year I have also had oats upon it, which have been nearly as good a crop as No. 2.

No. 4, thirty-two and a-half acres, I broke up in 1842, and have managed it in the same manner, only, instead of cross-ploughing it, I was under the necessity of ploughing it the same way it was first ploughed, going, however, twice the depth. The furrow being so tough it would not cross-plough, so that some parts had to be dug with the spade. In breaking up about one acre, some small parts of this field bore the marks of having, at some distant period, been ploughed; but none of the moor had ever been cultivated for generations. The value put upon this moor, when I took the farm, was 5s. per acre.

In 1842 I drained another moor, called the Knox Moor, of the extent of forty-three acres. This moor was very wet, and required nearly all thorough draining. It was generally a black moor soil, upon a red clayey subsoil, having a portion of sand in it: it was covered with rushes, heather, and whins. After draining, which I did at eighteen feet apart and twenty-seven inches deep, I ploughed it with a light furrow, cross-ploughing it this summer, and broke it with heavy harrows the same way as the other moors, and have laid upon it the same quantity of lime I laid on Millstanerig Moor, 75 bushels per acre. Several parts of this moor had at one time been under the plough, but was all

quite a waste when I commenced it. The value I put upon it was 6s. per acre.

In breaking up all the moors, I had to contend with large earth-fast stones, immense numbers of them being in some fields. The way I raised them was by marking them when ploughing, a number of men followed with picks, spades, and large wooden levers, about seven feet long, shod with iron at the end. These levers I find to be excellent instruments for the purpose, enabling us to raise stones of some tons weight. If the stones were too large for raising, which sometimes was the case, I dug a deep hole below them, and buried them. After raising the stones, I broke them small with sledge-hammers or wedges, and carted them off to drain other fields.

Unfortunately I am not able to give an exact report regarding the produce, not having kept a separate account of the newly improved from the old crop land, and not having a particular object in view at the time; I may mention, however, that, generally, the crops were bulky, and many of them good, and that in this district, (where, before I commenced, there was scarcely any draining, although now there are tile-kilns in every direction, and furrow draining carried on extensively,) they were much spoken of, and by all pronounced good, the turnip crops especially.

Annexed is a statement of the expense of improving the different fields mentioned above:—

Knockrig Moor—30 Acres.

To 500 roods stone drains (18 feet to the rood) at 1s.	£25	0	0			
First ploughing at 12s. per acre - -	18	0	0			
Two other ploughings at 7s. each time -	21	0	0			
Harrowing do. two times, at 7s. per acre each time	21	0	0			
3,150 imp. bushels lime, at 5 d. per bushel at the kiln	72	3	9			
Carting do. from the kiln, and laying it on at $1\frac{1}{2}$d.	19	13	9			
Rooting out whins, raising earth-fast stones, &c.	36	0	0			
Total expense of improving Knockrig Moor				£212	17	6

60 Acres in Different Places.

To 7,000 roods of drain, mostly stone, at 1s. -	£350	0	0			
One ploughing at 10s. per acre - - -	30	0	0			
4,500 bushels lime at the kiln, at 5d. per bushel -	93	15	0			
Harrowing, at 7s. per acre - -	21	0	0			
Rooting out whins, raising earth-fast stones, and levelling a number of places with the spade -	30	0	0			
Total expense of improving sixty acres				524	15	0

Millstanerig Moor—91 Acres.

To $10,678\frac{3}{4}$ roods of drain, including the expense of boards and slates for soles for the tiles, at 1s. 3d. -	£667	8	$5\frac{1}{4}$			
Ploughing 81 acres, first time, at 12s. -	48	12	0			
Digging 10 acres with the spade, at £2 -	20	0	0			
	£736	0	5			
Carry forward,				£737	12	6

	£	s.	d.	£	s.	d.
Brought forward,	£736	0	5¼	737	12	6
Ploughing 91 acres, two other times, at 7s. -	63	14	0			
Harrowing do. two times, at 7s. per acre each time	63	14	0			
6,825 bushels of lime, carting and laying on do. at 6½d.	184	16	10½			
Raising earth-fast stones, moss-trees, carting off do., and levelling holes, peat hags, &c. -	40	0	0			
Total expense of improving Millstanerig Moor				1088	5	3¾

Knox Moor—43 Acres.

	£	s.	d.	£	s.	d.
To 4,822 roods drain, including soles, at 1s. 3d. -	£301	7	6			
Ploughing, first time, at 12s. per acre -	24	6	0			
Ploughing two other times, at 7s. each time -	28	6	0			
Harrowing do. two times, at 6s. each time -	24	6	0			
3,225 bushels of lime, carting and laying on do., at 6½d.	87	6	10½			
Raising earth-fast stones, and carting off do. -	10	0	0			
Rooting out whins, and levelling holes with the spade	12	0	0			
Total expense of improving Knox Moor				487	12	4½
Total expense of the whole 224 acres				£2,313	10	2¼

The expense of fencing is not included in the above statement, the landlord being at the sole expense; consequently, I have not the vouchers, but it may be estimated at £80.

In improving waste land, the first thing that ought to be attended to, when the land is wet, is complete draining, the depth of the drains and the distance apart being regulated by the nature of the soil and subsoil. Complete draining, however, is absolutely necessary to ensure the permanency of the improvements; as, from my own experience, I have found all the places I have most thoroughly drained not only pay well during the first cropping, but, when laid out into grass, retain their improved character, and ultimately pay much better than the parts not drained, or only partially so.

This being admitted, next comes the question of—What is it best to drain with? Wherever I have had stones abundant, I have used them; wherever they were more expensive to procure than tiles, I have used tiles; but even when I have used stones, I have found it a good plan to put tiles into the main drains, as they permit the water to run quicker off than stones, and clear away any sediment, which is apt to lodge in the main drains, better than stones. The drains, also, should never, if possible, be put into an open ditch, but be run into a main drain, with a tile in it, of size in proportion to the quantity of water in the drain, the mouth of the main drain being led as near as possible to the lower end of the field, by which means the main drain, having a considerable quantity of water in it, the mouth can be attended to, and kept constantly clear, which is not the case when the branch drains are run into open ditches every few yards; as it must be kept in mind that drains stopped at their

mouths for even a few days may be permanently destroyed. Open ditches, when practicable, should be dispensed with in fields altogether.

In filling drains with stones, I have found, on all land with an open or sandy subsoil, that it is a great mistake having the drains cut too narrow. The narrow drains, which answer in clayey soils, in the open or sandy subsoils, I have always observed, in a few years, were worthless. Those which were at least six inches wide in the bottom I found answer best in these soils: neither should the stones be broken so small as in clayey soils, because, when broken very small, the sandy particles which filter into the drains are more apt to lodge, and ultimately choke the drains. As a general rule, the size of the stone I found to answer best on soils of this description, was that which was broken to half the width of the drain—that is, when the drain was six inches wide, the stone should go through a ring of three inches, and so on in proportion. I make this observation after a great variety of trials on different kinds of soil, having, on this farm alone, in six years, put upwards of 38,000 roods of drain, (18 feet to the rood,) or fully 130 miles. The drains, when filled with stones, should be covered with turf, pared off the surface of the drain, and reserved cut for the purpose.

When drains are filled with tile, it should be laid down as a rule, that wherever the subsoil is soft, or what is called a pouring sand, or moss, or any kind that does not firmly carry the tile, that soles of some kind should be used. Slates I found the best on the soft clay or pouring sand; boards on the deep moss.

After draining, which should always be the first operation when required, ploughing or breaking up should follow. When the turf is very tough, and any way free from stones, I have found the best plan to make the sock of the plough sharp, and nearly as wide as the furrow intended to be cut, the ploughmen keeping a large file with them, for the purpose of sharpening the sock when required; and to plough the land with a very shallow furrow, as thin as it can be managed, the broad sharp sock enabling this to be done with comparative ease. The furrow should then be left for eight or ten months to rot, after which it should be cross-ploughed, where this can be done, or, when it is still too tough for cross-ploughing, it should be ploughed the same way it was first done, but much deeper; then it should be well harrowed, and rolled with a heavy roller, and left again for a few months, when it should be limed, and ploughed again with a light furrow, and it is then ready for the seed.

I have always found it pay me better to fallow waste land a year in this manner, taking, after fallowing and liming,

two white crops in succession, than taking a crop the first year. In the one way I have had good crops, in the other a poor one, and the land unfit for a second or for turnips. It rots the land, and prepares it for turnips, which should always, if possible, be made the third crop, and this eaten off with sheep makes the whole perfect.

When practicable, I would decidedly recommend using the subsoil plough. On this farm, on the waste land, I have hitherto been prevented, in a great measure, from using it, by the immense quantity of earth-fast stones in the land; but I hold it, next to thorough draining, to be the greatest improvement in agriculture in modern times.

Lime I look upon as almost indispensable for all newly improved land when dry, though I have found on light soils, especially on moor with a black surface, and moss, it may easily be overdone. On some parts of this description, which I limed, for a trial, with 120 bushels imperial measure per acre, the corn was worthless, not from want of straw—for the crop was bulky—but it was seized with blight, scarcely a pickle being in the heads, and every yard could be traced where the lime was put on of that thickness; and on the parts which were lighter done, and those which had none, the ears were well filled. In the turnip crop, however, it was different, the turnips being good in proportion to the quantity of lime laid on. Where no lime was used, was a very poor crop; where lightly done, a fair crop; and where the land was limed heavily, the crop was very bulky. The grass also was good in proportion to the quantity of lime used; indeed I found generally, on all light moory soils, that it was not easily overliming for green crops; for white crop, on the contrary, easily overdone; and, after repeated experiments, I arrived at the conclusion that, on all soils of this description, 75 imperial bushels per acre is as much lime as can safely be used. I ought, however, to mention, that the lime I used was of very superior description both as regards purity and burning—indeed better quality of lime could not be found anywhere.

COMMUNICATION to the SOCIETY from LORD STANLEY, her Majesty's Secretary of State for the Colonies, with LETTER from GOVERNOR MOODY, regarding the Introduction of the TUSSAC GRASS of the Falkland Islands.

Downing Street, 20*th May* 1844.

Sir,—I am directed by Lord Stanley to transmit to you, to be laid before the Committee of the Highland Society, the enclosed copy of a dispatch from the Governor of the Falkland Islands, in which he recommends the introduction of the Tussac grass into the Orkney and Shetland Islands for cultivation. Lord Stanley would be glad to be informed whether the Society feels disposed to purchase any portion of the Tussac seed which has been sent to this country for sale. The parcel of seed to which the Governor refers has not as yet been received at this department, but it may be expected by the next vessel which shall arrive from the Falkland Islands.—I have the honour to be, &c.

G. W. HOPE.

The Secretary of the
Highland and Agricultural Society,
Edinburgh.

Government House, Falkland Islands,
17*th January* 1844.

My Lord,—A settler, named Jergen Christian Detliff, is desirous of forwarding to England, to be offered for sale, a parcel containing 6 lb. of Tussac seed. As he is of the labouring class, and unacquainted with business, he requested permission to forward it through me. I now do so, and venture to address it to your Lordship, considering it a national object to introduce this grass into England; and conceiving that your Lordship may be desirous of purchasing the parcel of seed on the part of her Majesty's Government.

The settler, Detliff, expects to receive not less than £2 : 10s. per lb.*

I take the liberty of recommending the individual for future employment, as I have hitherto found him industrious, honest, and sober; and, probably, for a large order he would be content with a less price per lb.

Conceiving that all remarks relative to the Tussac grass will be in some degree interesting to your Lordship, I take the liberty of noticing that I have proved to my own satisfaction nothing can answer better than the Tussac sown and planted out in rows, the tufts of grass being about six feet from centre to centre. I am resolved to pursue this practice by having a large field laid

* The Society has taken 2 lb. of this seed, which will be put into the hands of Mr Lawson, the Society's seedsman, as soon as it arrives.—Ed.

out at Port William, in order to cut bundles through the winter to fodder horses and cattle in a stable, in the same manner as is done with the Guinea grass in the West Indies.

I know that at present it may be cut twice in the year; but, under proper cultivation, it may be gone over much oftener. It greatly improves by cutting, and grows fast. Horses injure it by grazing, and pigs destroy it. My present experiment tends to shew that it will grow on almost any soil, and that it is not necessary for it to be exposed to the spray of the sea, although a width of from 300 to 400 yards along the shore is the place of its natural growth.

In some places the extent of the patches appears to be very capricious—the reason of which I cannot discover, as it occurs where the soil and other circumstances appear to be uniform. This is particularly illustrated on an island of some elevation in Port Salvador.

Although the Tussac grass may be cut, and amply remunerate the planting in the first year, it seems to take three years from the seed to arrive at perfection; but the tufts bear "planting out" extremely well. As to how many years the same roots may last I can offer no information. Decayed portions of the root appear to accumulate; but in a properly attended piece of ground these would be annually removed. Under our present imperfect system, allowing the cattle to roam and graze at will, pulling out, wasting, and trampling as much as they eat, the rough irregular patches of Tussac on "Long Island," amounting together to about 150 acres, keep in good fat condition for six months* 250 cattle and 70 horses. Under proper management, it is my opinion the same quantity would be found to maintain three times that number throughout the year.

The grass rises high above the snow, is fresh and green all the winter, and, from its height, completely shelters the horses and cattle lying among it.

Perhaps the best experiment which could be made in England would be to plant Tussac in one of the small islands of the Orkneys, such as "Hunda," if it met with the approbation of the owner; and I conceive it would be greatly to the advantage of the landed proprietors of the Orkneys and Shetland Islands to send from among them an intelligent person to the Falkland Islands to study the habits of the grass, and to collect seed: he should arrive there early in October.

I am sanguine enough to hope that the introduction of Tussac grass into those islands would replace the loss of revenue to proprietors from the depressed value of the kelp, and I hope your Lordship will be inclined to consider this a subject of sufficient

* The cattle are kept on "Long Island" only during the winter months.

interest to the residents in that part of Great Britain, and the west coasts of Scotland and Ireland, to cause my remarks to be forwarded for their consideration.—I have the honour to be, &c.,

R. C. MOODY, *Govr.*

EXPERIMENTS WITH SPECIAL MANURES.

By Mr A. F. Gardiner, Overseer to W. M. Fleming, Esq. of Barrochan, Renfrewshire.

[Premium, Thirty Sovereigns.]

Although for a number of years I had turned my attention to manures, and various substances used as such, it was not till 1840 and 1841, when I conducted a number of experiments to ascertain the value of, and best mode of applying, artificial manures, under the direction of my present employer, that I was struck with the conviction that a new era was about to commence in agriculture, to which no limit could be assigned, and that the application of chemistry to agriculture and accurate experiment alone were wanting to render the use of artificial manures most beneficial to the country.

In 1842, with the sanction of my present employer, I conducted a number of experiments on a larger scale than formerly, and particularly those experiments with specific manures, for reports on which the Highland and Agricultural Society have offered premiums. These have also been varied and compared, and the results accurately ascertained, the detail of which I now proceed to give, specifying the substances applied as a fertilizer to each description of crop in the year 1842, and also experiments in 1843, as far as the results could be ascertained, to this period, 20th Nov. 1843.

No. I. *Yellow Turnips.*—The ground, one imperial acre, divided into four portions, of a rood each. Jones' Yellow Turnip-Seed sown 13th June, when the Bones were drilled in Sulphate of Soda; dressing put on 24th June; the ground prepared with 35 cubic yards of dung; turnips lifted, topped, tailed, and weighed, 2d December.

Bone-dust.	Burned Bones.
Sulphate of Soda.	Nothing but Farm-yard Dung.

Nos. of Dressing.	Description of Dressings.	Quantity of Dressings applied per Imperial Rood.	Cost of Dressings p. Imperial Rood.		Produce in Tons, &c. per Imperial Rood.				Produce in Tons, &c. per Imperial Acre.				Value per Imperial Acre at 15s. per Ton.		
			s.	d.	tons	cwt.	qr.	lb.	tons	cwt.	qr.	lb.	L.	s.	d.
1.	35 yards, farm-yard Dung,	...	...		4	5	3	5	17	3	0	20	12	17	5
2.	Burned Bones, .	3 Bushels,	8	3	5	16	0	14	23	5	1	0	17	8	9
3.	½ inch Bones, .	3 Bushels,	8	3	4	17	1	6	19	7	2	24	14	10	9
4.	Sulphate of Soda,	¾ Cwt.	6	0	5	0	1	0	20	1	0	0	15	0	7
5.	Guano and 20 yards Dung,	¾Cwt. Guano.	15	0	6	17	1	7	27	9	1	0	20	11	11

The soil upon which these turnips were grown is an alluvial loam of from three to four feet deep, quite level, bounded by a rivulet on the south side, and superincumbent upon blue clay and sandstone. It was thoroughly drained with tiles some years ago, and is perfectly dry. The ground was selected of nearly as uniform a quality as possible, about the centre of twelve Scotch acres of turnips, and prepared, as directed by the Highland Society, with farm-yard dung, the two kinds of bones being drilled in with the seed, and the sulphate of soda put on as a top-dressing during the time of rain, after the turnip plants had come into the rough leaf; the drills twenty-eight inches apart, and the plants thinned to ten inches in the drill. They brairded well and evenly, and continued to grow till lifted in December. No. 1 was a fair crop, of moderately-sized bulbs. No. 2, burned bones, were remarkable all the season, having the smallest tops of any of the lots, and the largest bulbs. No. 3, half-inch bones, of the same quality as No. 2, but unburnt, had larger tops than No. 2, but did not fill so well out in the bulb. No. 4 had the strongest tops of any of the lots, taller, broader leaves, and more luxuriant, of a lighter green colour; bulbs of good size. Along with the other experiments, there was a weekly account kept of their progress; but the above is all that is worthy of notice. It was considered advisable to give the result of one-fourth acre of land, which was manured with dung and guano, as the produce was so superior, both in respect to the weight of turnips in 1842 and the after-crop of oats in 1843, which was not only much superior to that portion manured with dung alone, but also to the portions, Nos. 2, 3, and 4, dressed as stated in the Table, and which were all superior to No. 1.

No. II. *Potatoes.*—Connaught Cups, planted about 4th May 1842; top-dressed 4th July during time of heavy rain; lifted before 20th October, when they were measured and weighed. Quantity of land in each plot, one-fourth of an imperial acre.

Soot.	Sulphate and Nitrate of Soda.
Sulphate of Soda and Sulphate of Ammonia.	Nothing but Dung.

Nos. of Dressings.	Description of Dressings.	Quantity of Dressing applied per Quarter of an Acre.		Cost of Dressing per Quarter of an Acre.		Produce in Pecks, each 35 lbs., per Quarter of an Acre.	Produce in Bolls each 16 pks. per Quarter of an Acre.		Produce per Imperial Acre in Tons, etc.				Value of Potatoes per Acre at 41s. per Ton.		
		qrs.	lb.	s.	d.	pecks.	bs.	pks.	tons	cwt.	qr.	lb.	L.	s.	d.
1.	Nitrate of Soda.	0	14	2	6	244	15	4	15	1	0	16	30	2	3
	Sulphate of Soda.	1	0	1	9										
2.	Soot in Bushels, 10.	...		2	6	168	10	8	10	2	1	0	20	4	6
3.	Dung, 35 cubic yards.	...		..		147	9	3	9	3	3	0	18	7	6
4.	Sulphate of Ammonia.	0	14	2	6	213	13	5	13	6	0	16	26	12	3
	Sulphate of Soda.	1	0	1	9										

The part of the field upon which the above experiments were tried has a gentle inclination to the east; soil a stiff loam, lying upon a blue clay subsoil of great depth, superincumbent upon sandstone rock. It had been thoroughly drained with tiles and wood soles in 1840 and 1841; the drains twelve feet apart. The ground was trenched with the spade sixteen inches deep in the winter of 1841 and 1842, after which it was prepared in the usual manner with thirty-five cubic yards of farm-yard dung, and the potatoes planted in cut-sets laid above the dung in drills thirty inches apart. An imperial acre was carefully measured and divided into four parts, three of which were dressed with the above-mentioned articles upon 4th July, when the plants were six inches high. In the course of a week, the effects of the dressings could be pointed out by the change of colour to a dark green, and greater luxuriance of stems over the undressed—and which difference continued on Nos. 1 and 4 till the tops were destroyed by frost in October. The appearance of the different dressings which were noted down, from time to time, were fully borne out by the results given in the Table, viz. :—

No. 1 came away quickest and strongest, and continued its effects till the stems were destroyed by frost. No. 4 next, but its effects did not last so long in keeping up the growth of the plants as No. 1. No. 2, soot, made the same change of colour, but was not so luxuriant in growth as Nos. 1 and 4, and its effects were more rapidly exhausted, the stems beginning to ripen about a fortnight before the others, which were quite green when destroyed by frost. No. 3 came to maturity about the same time as No. 2. I may remark that this kind of potato does not answer so well for top-dressing as red and white dons, or the different kinds of early potatoes, from its greater luxuriance of growth upon heavy land, as also its lateness in coming to maturity, and which the dressings Nos. 1 and 4 have a tendency to increase and prolong. The oats this year (1843) are remarkably strong and heavy on the dressed portions Nos. 1 and 4, but on Nos. 2 and 3 they are much inferior.

No. III. *Barley.*—Effects of Top-Dressings of various Salts on Common White Barley, sown 14th April; top-dressed the beginning of May; cut down 25th August; thrashed, cleaned, measured, and weighed before the 15th October 1842.

Saltpetre.	Salt.
Nitrate of Soda and Salt.	Nothing.

Nos. of Dressings.	Description of Top-dressings.	Quantity of Dressings per Quarter of an Acre Imperial.	Cost of Dressings per Quarter of an Acre Imperial.	Weight of Straw and Grain when cut, per Quarter of an Acre Imperial.	Weight of Grain thrashed and cleaned, fit for Market, per Qr. of an Acre Imperial.	Weight of Straw when thrashed per Quarter of an Acre Imperial.	Weight of Grain per Bushel from Dressing.	Number of Bushels per Quarter of an Acre.	Increase of Grain from Dressing.
		cwt. qr. lb.	L. s. d.	lbs.	lbs.	lbs.	lbs.	bu. lbs.	bu. lbs.
1.	Nothing . . .	...	...	3240	650	770	55¼	11 42	...
2.	Saltpetre . . .	0 1 0	0 7 0	3430	779	1180	54	14 23	...
3.	Common Salt . .	0 3 0	0 1 1½	3270	756	940	57	13 15	1 30
4.	Nitrate of Soda	0 0 21	0 3 8						
	Common Salt	0 1 0	0 0 4½	3592	782	982	56	13 54	2 12
5.	Guano	0 3 0	0 18 9	4200	864	1150	54	16 0	4 12
6.	Lime and Salt with dissolved Bones .	0 3 0	0 7 6	3850	840	990	56	15 0	...

The field upon which these experiments were tried, along with many others, contains about six imperial acres, upon the side of a hill with a south exposure. The soil, a light brown loam of medium quality, superincumbent upon a stiff stony till of great depth, lying between trap-rock and sandstone—the trap disappearing at the north side of the hill, and the sandstone commencing at the foot of it, upon the south side. The west side of the hill is bounded also by the trap, while the east gradually recedes into a level of alluvial land of great extent. It had been thoroughly drained with tiles some years previous to its being broken up, and was worth about £2 per acre rent. In the spring of 1842 it was trenched out of lea, with the spade, to the depth of twelve inches, at an expense of £3 : 6 . 8 per imperial acre, all marks of ridge and furrow being taken away, and the land laid down level, as it was to be sown down again (with the barley crop) with a mixture of grass-seeds for permanent pasture; it was all dressed over, except two acres where the experiments were to be tried, with two chaldrons of quicklime, slaked with water in which common salt had been dissolved; and, before sowing the barley, it was top-dressed with two and a-half cwt. per acre, of Turnbull's dissolved bones in muriatic acid. With the exception of the two acres left for experiments, the barley was sown broad-cast two and a-half bushels per acre, and gave a return of clean grain, sold in the market, of ten bolls of six bushels each, averaging 56 lbs. per bushel, and brought above 20s. per boll. Nos. 2 and 3 burned the plants somewhat, which recovered after rain; but another portion, dressed with No. 2, never recovered. Nos. 2 and 4 took the lead of No. 3, and kept it all the season in point of appearance, being of a darker green and stronger. No. 3, dressed with common salt, was throughout the season of a lighter green colour than any of the others, but salt, it appears, has the remarkable effect of adding to the weight of the bushel of the grain grown with it. A weekly account was kept of the appearance produced by each description of top-dressings, but the above summary of them seems sufficient. No. 5, (guano,) which is given extra, not being in the diagram, was, all the season, superior in point of appearance, to any of the other dressings in the field.

From what has been observed, both in this and former seasons, all dressings and manures containing a large per centage of nitrogen, such as guano, rape-dust, sulphates, and muriates of ammonia, nitrates of soda, &c., make the grain grown by them lighter in weight per bushel, while, at the sametime, they give more bushels per acre, as well as more straw. On the other hand, such dressings and manures as common salt, sulphate of

soda, and magnesia, and bone dust, invariably give heavier grain per bushel, but fewer bushels per acre. Now it appears from this, if the same be found to hold good in other places, that the most judicious and most economical method is to use a mixture of these, as common salt with nitrate of soda, or any of the others. The one will give quantity while the other will give weight; because not one of the dressings enumerated above, except guano, contains all the ingredients required for the food of plants.

No. IV. *Rye-grass and Clover.*—Effects of dressings of various Salts upon Rye-Grass and Red and White Clover; made into hay in 1842; top-dressed 9th April; cut 30th June; weighed when cut, and again weighed when stacked, 22d July.

Sulphate of Soda.	Common Salt.
Nitrate of Soda.	Nothing.

Nos. of Dressings.	Description of Dressings.	Quantity applied per Quarter of an Acre.	Cost of Dressing per Quarter of an Acre.	Produce in Lbs. when cut green per Quarter of an Acre.	Increase * and Decrease ‖ in lbs. from Dressing cut green per Quarter of an Acre.	Produce when stacked of Win Hay in Imperial Stones per Quarter of an Acre.	Increased produce of Win Hay from Dressing, per Quarter of an Acre in Stones.	Produce per Acre of Win Hay in Imperial Stones and Lbs.	Value of Hay per Acre at 6d. per Imperial Stone.	Yield of Win Hay from 1000 lbs. fresh cut.
		cwt. qr. lb.	L. s. d.	lbs.	lbs.	st. lbs.	st. lbs.	st. lbs.	L. s. d.	lbs.
1.	Nothing.	...	...	2840	...	55 10	...	222 12	5 11 4	275
2.	Sulphate of Soda.	0 3 0	0 5 3	1936	‖904	46 8	‖9 2	186 4	4 13 2	337
3.	Common Salt.	0 3 0	0 1 1½	2689	‖151	50 4	‖5 6	200 0	5 0 0	262
4.	Nitrate of Soda.	0 1 14	0 7 6	4500	*1660	100 4	*44 8	401 0	10 0 6	312
5.	{ Salt, 14 lbs. Soot, 4 bush. }	...	0 1 4½	3180	*340	65 2	*10 0	280 0	7 0 0	287

The field contains about eleven acres imperial—is nearly level, with a south exposure—and has been for some years thoroughly drained with tiles, and is quite dry. The soil a stiff alluvial loam of good depth, superincumbent upon a heavy white clay; and is upon a four-course shift, viz.:—1*st*, oats from hay stubble; 2*d*, green crop, potatoes or turnips; 3*d*, wheat; 4*th*, hay, after which the same rotation follows. There was excellent wheat grown on it in 1841, exceeding forty bushels per acre. This

land is worth £3 an acre. Owing to the very dry weather at the time of dressing, their effects were not so quickly remarked as is usual from dressings; but by the last week of April, No. 4, nitrate of soda, had taken the lead of all the field in point of strength and darkness of colour. The field being examined every week till cut, and a register kept of the progress of the different dressings, No. 4 had always the superority in point of appearance, being of a darker green colour, taller in the stems, broader in the leaves, and more numerous plants than the other dressings, of which were a number of experiments in the field of different kinds. Nos. 2 and 3 were not different in point of appearance from the undressed portions, but, if anything, was lighter in colour; but the grasses upon No. 2 were quite of a different kind, there appearing to be hardly any of the sown grasses except a few straggling stalks of rye-grass. But No. 2, sulphate of soda, though at no time appeared to produce so vigorous a growth as No. 4, nitrate of soda, it is still worthy of trial, from the fact that on some soils the crop, after being top-dressed with it, gives a greater proportion of dried hay than any other dressing; for it appears from the Table that 1000 lbs. green-cut undressed gave 275 lbs. of dried hay, and the same quantity top-dressed with sulphate of soda gave 337 lbs., or 62 lbs. more, while nitrate of soda gave only 312 lbs.; and from some trials I have made on a small scale, it seems that the most profitable way of using the dressings, Nos. 2 and 4, is by mixing them together, which, while it lessens the first cost, impairs none of the effects of the nitrate of soda in producing a vigorous growth, while the sulphate of soda adds greatly to the weight of dried hay; as, in one case, with nitrate of soda, at the rate of 1 cwt. mixed with ½ cwt. sulphate of soda, 1000 lbs. of green grass gave 362 lbs. of dried hay, being 50 lbs. more than from 1½ cwt. of nitrate of soda alone, while, at the same time, there was a difference of 3,000 lbs. of green per acre in favour of the nitrate of soda itself. Of No. 3, common salt, little effect was remarked; and, owing to the great dryness of the season, it would have been better with a less quantity, as the grasses seemed burned and stunted in their growth after the dressing was put on, and from which they did not recover. It may be remarked that the top-dressing of nitrate of soda gave an increase of above a ton of dry hay per acre.

No. V. *Oats.*—Sandy Oats, sown 16th April. Nos. 2 and 4 top-dressed on the same day; No. 3 watered 6th May. Cut down 14th September; thrashed, cleaned, and weighed by the 6th October 1842.

Ammoniacal Liquid.	Sulphate and Nitrate of Soda.
Bones dissolved in Sulphuric Acid.	Nothing.

Nos. of Dressings.	Description of Dressings.	Quantity of Dressings applied per Quarter of an Acre Imp. qua. lbs. gal.	Cost of Dressings per Quarter of an Acre Imp. L. s. d.	Weight of Straw and Grain when cut in Sheaf per Quarter of an Acre Imp. lbs.	Weight of Grain when thrashed, and cleaned fit for Market, per Quarter of an Acre Imp. lbs.	Weight of Straw when thrashed, per Quarter of an Acre Imp. lbs.	Weight of Grain per Bushel from each description of Dressing. lbs.	Number of Bushels clean Grain per Quarter of an Acre Imp. bu. lbs.	Increase of Grain from Dressing. bu. lbs.
1.	Nothing, ...	...	...	1955	440	670	39	11 11	...
2.	Bones dissolved in Sulphuric Acid,	3 0 0	0 7 0	2717	668	997	42	15 38	3 27
3.	Ammoniacal Liquid, ...	0 0 30	...	2255	550	865	40	14 0	2 29
4.	Sulphate of Soda / Nitrate of Soda,	1 14 0	0 3 4	2496	651	928	41	15 36	4 25

The part of the field upon which the above experiments were tried, has a gentle inclination to the south. It was trenched with the spade sixteen inches deep, in the spring of 1842, out of lea which had lain about seven years, and was drained with tiles at twenty feet apart, having been before only partially drained with stones. It is now (1843) completely dry. The soil is partly moss and partly a sand or gravel loam which were mixed in the trenching. The dressings, Nos. 2 and 4, were put on, and slightly harrowed in, before the oats were sown. The oats brairded well. No. 3 was mixed with 120 gallons of water, and sprinkled upon the oats during the time of rain after they had come up. No. 4 came earlier through the ground than the others, and was of a darker green colour, so that the square upon which it was put marked itself out from a distance. No. 2 had no change of colour, but was very luxuriant in growth, and kept the lead of the others, in point of strength, all the season. A few days after No. 3 was sprinkled, the colour changed from a light to a dark green, and the plants made great progress for some time, appearing to

outstrip the other dressings; but about the middle of July it began to fail in growth, and shewed the usual signs of coming to maturity, while Nos. 2 and 4 were in full growth. No. 3 was the earliest ripe—No. 4 next—and No. 2 latest. No. 1 (nothing) was ripe nearly at the same time as No. 3. A register was kept, but nothing remarkable was noticed from what is given above. It appears that, however needful it may be to find out some suitable top-dressing for oats, upon uplands where the ground is poor and thin, such land should at no time be broken up without something being added to enable it to bear a good crop. Yet most of the land upon which oats are grown in the low lands does not require dressings to be given them; for, in the generality of seasons, oats are strong enough for a good crop, and, if dressings are added, they lie down, and are, in a great measure, destroyed, particularly in wet seasons. No addition is required to ensure a good crop of oats from lea that has been suitably laid down in grass and regularly pastured; and, if sown after green crop, the land will in general be found of sufficient strength to yield a good return without the aid of dressings.

No. VI. *Pease.*—The effects upon Pease of Gypsum, Sulphate of Soda, and a mixture of Sulphate and Nitrate of Soda, was tried, but the experiment failed, in consequence of a considerable portion of the crop having been destroyed by birds and rabbits. The only remark I can make, at all worthy of notice, is, that the portion top-dressed with Sulphate and Nitrate of Soda was extraordinarily heavy in straw.

Gypsum.	Sulphate of Soda.
Sulphate and Nitrate of Soda.	Nothing.

EXPERIMENTS REPEATED IN 1843.

Turnips.—The effects upon the Turnip-Crop of the substances mentioned in the following diagram, together with that of several other substances, was again repeated this year, (1843;) but as they have not yet been lifted, (Nov.,) the result cannot be

accurately ascertained. It may, however, be remarked, that one portion, Guano and Dung, took the lead of all the others, and

Bone-dust.	Burned Bones.
Sulphate of Soda.	Nothing but Dung.

appears to be at least one-fourth heavier than any of the other portions. The portion with Burned Bones seems the next heaviest crop, although that from Sulphate of Soda appears to make the leaves larger and more luxuriant. All the four portions were equally manured with 35 cubic yards of Farm-Yard Dung; the portion with Guano and Dung was manured with 20 cubic yards Dung, and 2½ cwt. Guano, per Acre.

Potatoes.—The substances mentioned in this diagram were repeated upon the Potato-Crop of this year, (1843.) Rough Red Potatoes, planted 4th May; top-dressed 8th June; lifted, measured, and weighed, first week of October.

Soot.	Sulphate and Nitrate of Soda.
Sulphates of Soda and of Ammonia.	Nothing but Dung.

Nos. of Dressings.	Description of Dressings.	Quantity of Dressing applied per Qr. of an Acre Imp.			Cost of Dressings per Quarter of an Acre Imp.			Produce in Pecks, each 35 lbs. per Quarter of an Acre Imp.		Produce in Bolls each 16 Pecks per Qr. of an Acre Imp.			Produce per Imperial Acre in Tons, &c.				Value of Potatoes per Acre at 40s. per Ton.		
		cwt.	qrs.	lbs	L.	s.	d.	pks.	lbs.	bs.	pks.	lbs.	tons	cwt.	qr.	lb.	L.	s.	d.
1.	Soot in Bushels, 12		...		0	3	0	211	15	13	3	15	13	4	1	4	26	8	5
2.	Nitrate of Soda	0	1	0	0	4	4½	234	10	14	10	10	14	12	3	12	29	5	8
	and Sulphate of Soda, . .	0	1	14	0	2	3												
3.	Dung, 40 cubic yds.		...			...		189	25	11	13	25	11	16	1	4	23	12	7
4.	Sulphate of Ammonia and	0	1	0	0	4	6	25	5	16	1	5	16	1	1	20	32	2	4
	Sulphate of Soda,	0	1	14	0	2	3												
5.	Bones dissolved in Sulphuric Acid,	1	2	0	0	7	0	228	20	14	4	20	14	5	2	24	28	11	5
	and Carb. of Magnesia,	0	1	0		...													

The field upon which the above potatoes were grown is a light, sharp, gravely loam, rather thin, subsoil gravel, and has a slight inclination to the south. It was thoroughly drained with tiles two years ago—drains eighteen feet apart and thirty inches deep —and is now quite dry; worth 40s. of rent per acre. After draining, in the spring of 1842, it was ploughed out of lea, and oats sown, which gave a good crop. After the oats, at the end of 1842, it was ploughed with a broad deep furrow, and subsoiled. At the time of planting, it was cross-ploughed and harrowed, and all root weeds gathered off; after which a grubber, of three horses, was passed through it, and again harrowed and gathered. The drills were then drawn with a double mould plough at twenty-eight inches apart. The manure—forty cubic yards of farm-yard manure—was spread in the bottom of the drills. Potatoes cut and set upon the top of it, and covered with the plough about three inches deep. They were harrowed, and worked in the usual manner with the plough, drill-grubber, and hand-hoe. They brairded about the end of May, very healthy in appearance, and quite regular. After top-dressing, which was done during the time of rain, they made remarkable progress—so that, by the 24th June, Nos. 1, 2, and 4 had taken the lead in point of strength, and dark green colour, and which Nos. 2 and 4 continued to do till destroyed by frost on the night of the 28th September. No. 1 came away the same as Nos. 2 and 4; but these came to maturity earlier, shewing signs of ripening at the beginning of September. No. 5 is given here, as being put upon part of the same field as the others; and from the very remarkable effect it had in promoting the growth of the potato. It made no change in the colour of the leaves; but the plants, from being the weakest in the field, became strong and luxuriant, and continued to grow most luxuriantly till destroyed by frost, and, when the crop was lifted, was found to yield fully the largest tubers in the field. This trial was upon a smaller portion of ground than the rest, and top-dressed upon the plants when they were set up for the last time. I think, however, that it would perhaps be better to put the mixture in the bottom of the drills along with the dung. It was made by dissolving bones in sulphuric acid diluted with water in a tub, and let stand for some days. Carbonate of magnesia in powder was then stirred into it till it dried up all the moisture, when it was fit for use. I consider this dressing as worthy of a more extensive trial upon different soils. The cost of it as given in the Table is only probable, but it will rather be over than under the real cost, and a very small portion of it, mixed with other manure, would probably be sufficient. An experiment was also tried

in the field, of the comparative effects of half an acre manured with forty cubic yards of farm-yard manure, and another half acre with twenty cubic yards and five cwt. guano—the produce of the first being at the rate of forty-seven bolls, of five cwt. each, per imperial acre, and of the latter sixty-three bolls. This shews the beneficial effects of mixing guano with dung, as well in an economical point of view, as from yielding a greater produce. It may be remarked that a mixture of fifteen cwt. of guano with moss, or other inert vegetable matter, seems, from several experiments that have been tried, to yield a crop of potatoes equal to that produced by forty cubic yards of dung.

Wheat.—The experiments with the substances mentioned in this diagram were repeated this year (1843) upon Wheat. Wheat (Hunter's White) sown beginging of October 1842; top-dressed 12th May; cut down and weighed 15th September; thrashed, cleaned, weighed, and measured second week of October 1843.

Saltpetre.	Salt.
Nitrate of Soda and Salt.	Nothing.

Nos. of Dressings.	Description of Dressings.	Quantity of Dressings applied per Quarter of an Acre Imp.	Cost of Dressings per Quarter of an Imp. Acre.	Weight of Straw and Grain when cut, per Quarter of an Acre Imp.	Weight of Grain when thrashed and cleaned fit for Market, per Quarter of an Acre Imp.	Weight of Straw when thrashed, per Quarter of an Acre Imp.	Weight of Grain per Bushel, from Dressings.	Number of Bushels per Quarter of an Acre Imp. of each Dressing.	Increase of clean grain from Dressings.
		cwt. qr. lb.	s. d.	lbs.	lbs.	lbs.	lbs.	bus. lbs.	bus. lbs.
1.	Saltpetre, ...	0 1 14	10 6	5,580	660	1,990	60¾	11 41¾	2 19
2.	Nitrate of Soda	0 1 0	4 4½	4,720	680	1,720	61½	11 7	1 46
	and Salt, . . .	0 1 14	6 0						
3.	Salt, ...	0 3 0	1 1½	3,920	660	1,320	63	10 30	1 8
4.	Nothing, ...	...	...	3,360	580	1,090	62	9 22	
1.	Guano, ...	0 3 0	8 3	3,880	690	1,480	62½	11 15	3 11
2.	Linseed-Cake Dust,	0 3 0	8 3	3,760	700	1,360	61	11 29	3 25
3.	Rape-Cake Dust, .	1 1 0	8 1½	4,280	760	1,560	62	12 26	4 22
4.	Nothing, ...	...	...	2,880	500	900	62	8 4	

The field upon which the above experiments were tried is a stiff loam about nine inches deep, subsoil a stiff yellow till, full of small stones, superincumbent upon sandstone rock, and was thoroughly drained some years since, and is quite dry. It is

nearly level, bounded on the west side by a plantation; the other sides are exposed. The wheat was sown after potatoes at the beginning of October 1842. The potatoes were manured with forty-five cubic yards of farm-yard dung, and gave a very fine crop of fifteen tons per Scotch acre. After they were lifted, the land was ploughed about six inches deep, seed sown and harrowed in; it brairded well, but suffered severely through the course of the winter, and was rather thin of plants in spring 1843. The part selected for dressing was of as nearly as possible a uniform quality, both as regards soil and quality of plant. The substances mentioned in the diagram, as also those in the lower part of the Table, were put upon one side of the field. These dressings were applied during heavy rain, and in ten days Nos. 1 and 2 of the diagram were distinctly marked out from the others by their dark green colour and vigorous growth. By the 9th of June a great improvement had taken place upon these two portions, and which continued till cut, viz.:—They were dark green in colour, broad and succulent in leaf, taller in stems, and had more stems, from having tillered well. No. 2 appeared to have tillered most, but was not so tall in the stems as No. 1. When nearly ripe, Nos. 1 and 2 were laid down quite flat, being the only laid wheat in the field. No. 3, common salt, made no change of colour, but was considerably improved from the plants tillering well, and they had small, stiff, shining, wiry straw. It was not laid, and ripened evenly. After dressing, the hares and rabbits seemed to be very fond of this portion, and it was more injured by them than the rest of the field. A register was kept of their appearance from time to time, but the above comprises all that is worth mentioning.

All the dressings given in the under part of the Table had the effect of changing the colour to dark green, accompanied with a strong vigorous growth, and they all appear to have nearly the same effect when applied in the above proportions. I may mention that No. 3, rapecake-dust, had very coarse straw, and it will be noticed that guano does not lessen the weight of grain per bushel so much as nitrates of soda and potash, and that a mixture of it with salt would, there is reason to believe, from trials made, be one of the best dressings for wheat and other grain crops.

Grasses.—The experiments of the Effects of Top-dressing with Salts on Grasses were repeated this year upon Ten-years-old Lea intended to be cut for Hay.

Sulphate of Soda.	Common Salt.
Nitrate of Soda.	Nothing.

Nos. of Dressings.	Description of Top-Dressings.	Quantity of Dressings applied per Imperial Rood.	Cost of Dressings per Imperial Rood.	Produce in Lbs. when cut green per Imperial Rood.	Increase in Lbs. from Dressing cut green per Imperial Rood.	Produce when Stacked of Win Hay in Imperial Stones per Imperial Rood.	Increase produce of Win Hay from Dressing per Rood in Imp. Stones.	Produce per Imperial Acre of Win Hay in Imperial Stones and Lbs.	Value of Win Hay per Acre, at 6d per Imperial Stone.	Yield of Win Hay from 1000 lbs. fresh cut.
		Cwt. qr. lb.	L. s. d.	lbs.	lbs.	st. lbs.	st. lbs.	st. lbs.	L. s. d.	lbs.
1.	Nothing. . .	...	...	4820	...	100 3	...	400 12	10 0 5	312
2.	Nitrate of Soda,	0 2 0	0 8 9	5960	1140	138 5	38 2	533 6	13 6 7	325
3.	Common Salt,	0 3 0	0 1 1½	5160	340	110 8	10 5	442 4	11 1 1½	300
4.	Sulphate of Soda,	0 3 0	0 5 3	5260	440	131 7	31 4	526 0	13 3 0	350

The part of the field, one imperial acre, where the above dressings were applied, is a good sound loam, rather stiff, subsoil clay and gravel, and is as nearly level as possible, lying upon the banks of a rivulet. It is thoroughly drained with tiles, and quite dry. The sward is composed of a great variety of grasses, such as *Holcus lanatus*, *Cynosurus cristatus*, *Poas*, *Festucas*, *Lolium perenne*, *Phleum pratense*, *and Trifolium repens*, or those, however, predominate. Previous to 1843 it was grazed with sheep, and kept from three to four Leicesters or Cheviots per Scotch acre. After the dressings were applied, it was frequently examined, and, in consequence of their being put on during rain, they quickly shewed their effects, especially the nitrate of soda, by changing the colour to a very dark green, with broad and succulent leaves, so that, by the 4th of May, it marked itself at a great distance, and, till cut, continued its superiority. There was no change of colour on either of the two other dressings, but they were thicker in sward and taller of growth than the square which was not dressed. In making remarks, from time to time, upon these dressings, no particular distinction could be noticed among them, further than has been mentioned; nei-

ther was any particular grass noticed to predominate in any of the squares more than the rest of the field. I may mention that No. 1 is the average of two squares, each one-fourth of an imperial acre, at each side of those that were dressed.

Oats.—The experiments with the substances mentioned in this diagram were repeated this year (1843) upon Oats. Oats (Sandy) sown 20th March; top-dressed 6th May; cut down and weighed 8th September; thrashed, cleaned, measured, and weighed last week of September 1843.

Ammoniacal Liquid.	Sulphate and Nitrate of Soda.
Bones dissolved in Sulphuric Acid.	Nothing.

Nos. of Dressings.	Description of Dressings.	Quantity of Dressing applied per Quarter of an Acre Imp.	Cost of Dressing per Quarter of an Acre Imperial.	Weight of Straw and Grain when cut in Sheaf, per Quarter of an Acre Imperial.	Weight of Grain when thrashed and cleaned fit for Market, per Quarter of an Acre Imp.	Weight of Straw when thrashed, per Quarter of an Acre Imperial.	Weight of Grain per Bushel from each description of Dressing.	Number of Bushels clean Grain per Quarter of an Acre Imp.	Increase of Grain from Dressing, per Quarter of an Acre Imperial.
		qua. lbs. gal.	L. s. d.	lbs.	lbs.	lbs.	lbs.	bus. lbs.	lbs.
1.	Bones dissolved in Sulphuric Acid	4 0 0	0 8 4	4520	740	1060	39½	18 38	140
2.	Nitrate and Sulphate of Soda	1 14 0 1 14 0	0 0 2½ 0 2 3	4980	780	1260	40	19 20	180
3.	Ammoniacal Liquid,	0 0 40	0 3 4	4800	750	1050	39½	19 0	150
4.	Nothing,	...	...	3300	600	840	39	15 15	...

The field upon which these experiments were tried is a stiff alluvial loam of a good depth; subsoil a strong yellow clay lying on a flat, between trap rock on the west and sandstone on the east; it is exposed upon all sides, and bounded on the east by a rivulet. It was thoroughly drained with tiles nine years ago, and had lain about the same length of time in grass. It is worth about £2 per acre of rent. In the spring of 1843 it was trenched with the spade sixteen inches deep, at an expense of nearly £4 per acre, the grass, or top spading, being laid in the bottom of the trench, and the subsoil brought to the top. The oats were sown broad-cast and harrowed in; advantage was taken of rain to put on the dressings, after which the field was rolled. No. 1 was long in shewing any improvement, and it was not till the 24th June

that its effects were visible, at which time it began greatly to improve, and continued to do so till it ripened. The portion No. 2 had, by the 18th May, made a great improvement in appearance over the general crop, having changed from a sickly yellow to a dark green colour, and of a vigorous growth. No. 3 made the quickest change, and, till the beginning of July, it took the lead of the others, being dark green and vigorous in growth, at which time No. 2 took the lead, and kept it till cut; both portions, when growing, were of a darker green colour, stronger, taller, and of more vigorous growth than the rest of the field. No. 3, however, failed first in growth of any of the dressings, No. 2 being still strong and vigorous, and No. 1 made great progress, and looked better than No. 3 after it began to shoot. The appearance of the different portions continued much about the same as above noted till they began to ripen, when Nos. 2 and 3 were completely laid down, No. 1 being only partly so, No. 4, the undressed portion, standing quite upright. Ammoniacal liquid appears, from different trials made with it, to cause a quick vigorous growth at first, speedily changing the colour and strengthening the plants, but is evanescent in its effects compared with the dressings tried here containing nitrogen, the crop coming quicker to maturity, and, if grass, losing its vigour earlier in the season.

Beans.—Beans, sown 6th March; top-dressed 6th May; cut down and weighed first week of September; thrashed, cleaned, measured, and weighed second week of October 1843.

Gypsum.	Sulphate of Soda.
Sulphate and Nitrate of Soda.	Nothing.

Nos. of Dressings.	Description of Dressings.	Quantity of Dressing applied per Quarter of an Imp. Acre.	Cost of Dressing per Quarter of an Imp. Acre.	Weight of Straw and Grain in Sheaf when cut per Quarter of an Imp. Acre.	Weight of Grain when thrashed and cleaned fit for Market per Quarter of an Imp. Acre.	Weight of Straw when thrashed per Quarter of an Imp. Acre.	Weight of Grain per Bushel from each description of Dressing.	Number of Bushels clean Grain per Quarter of an Imp. Acre.	Increase of Grain from Dressing.	Decrease of Grain on each portion.
		cwts. qrs. lbs.	L. s. d.	lbs.	lbs.	lbs.	lbs.	bus. lbs.	lbs.	lbs.
1.	Gypsum	1 0 0	0 1 6	8000	1080	2320	64	16 56	200	...
2.	Sulphate of Soda	0 3 0	0 4 6	7500	840	1940	64	13 8	...	40
3.	{ Nitrate of Soda { Sulphate of Soda	0 1 14 0 1 14	0 6 6 0 2 5	7920	1120	2360	66	17 0	340	...
4.	Nothing	...	...	5920	880	1720	63	14 0	...	...

The same description applies to this experiment, as regards soil and other circumstances, as that given for Oats 1843, being part of the same field; the only difference being that, where the beans were sown, the land was dressed with three chaldrons of quick-lime per Scotch acre, slaked with water in which common salt had been dissolved, at the rate of one cwt. to a chaldron of lime. After dressing the beans were examined from time to time; but it was not till the end of June that any decided difference could be said to have taken place over the crop. No. 1, gypsum, was strongest, and had taken the lead of Nos. 2 and 3, as also of the general crop, and was fully the strongest straw when cut, but not so well podded as the others, gypsum appearing to give a greater impulse to the growth of straw than to pods. Nos. 2 and 3 burned the plants after dressing, from which they did not recover for some time. No. 3 was the first to recover, and was next to No. 1 in strength of straw, and fuller and larger podded than any in the field. No. 2 did not completely recover from the effects of the burning till near the end of August, when a most luxuriant second growth came upon them; and, in consequence, although they were nearly as heavy in straw as the others when cut in sheaf, they were not so heavy in grain as the general crop. From having to thrash them out so early in the season as to be enabled to give the result by the time specified in the Society's premiums for 1842, this experiment is not so decided as regards the weight of the beans per bushel on the different dressings as it would have been had they been stacked and thoroughly dry; but it may in some degree tend to shew the comparative effects of the different substances used.

I.—*Top-dressing Ten-year-old Lea.*

Experiments of the comparative effects and value of various mixtures of Specific Manures upon Grass for Hay from Ten-year-old Lea. These were tried upon the same field as the grasses in 1843. Top-dressed 21st April; cut 12th July; weighed as cut green, and again weighed when stacked, 24th July 1843.

Nos. of Dressings.	Description of Manures, Simple and Compound.	Quantity applied per Imperial Acre.	Cost of Dressings per Imperial Acre.	Produce in Imperial Pounds when cut green per Acre.	Increased Produce in Lbs. when cut green, per Imp. Acre from Dressing.	Produce in Tons, &c. when cut green, per Imperial Acre.	Produce when Stacked of Win Hay, per Imperial Acre in Imperial Stones.	Increased Produce of Win Hay from Dressing per Imperial Acre in Imperial Sts.	Quantity of Win Hay yielded by 1000 lbs. fresh cut of each kind of Dressing in Lbs.	Value of Hay per Acre when Stacked at 6d. per Stone.	Increased value per Acre from Dressing.
		cwt. qr. lb.	L. s. d.	lbs.	lbs.	tons cwts. qrs. lbs.	sts. lbs.	sts. lbs.	lbs.	L. s. d.	L. s d.
1.	Guano,	1 0 0	0 11 0	22,080	4,000	9 16 1 20	610 4	207 6	387	15 3 7½	5 2 7½
	Animal Charcoal,	1 0 0	0 4 0								
	Sulphate of Soda,	0 2 0	0 3 6								
	Common Salt,	0 2 0	0 0 9								
2.	Nothing,	...	...	18,080	...	8 1 2 2	402 12	...	312	10 1 0	...
3.	Guano,	1 0 0	0 11 0	22,720	4,640	10 2 3 12	649 2	246 4	400	16 4 1	6 3 1
	Animal Charcoal,	1 0 0	0 4 0								
	Sulphate of Soda,	0 2 0	0 3 6								
	Sulphated Urine,	0 2 0	0 9 0								
4.	Guano,	1 1 0	0 13 9	23,120	5,040	10 6 1 20	578 0	175 2	350	14 9 0	4 8 0
	Animal Charcoal,	1 0 0	0 4 0								
	Sulphate of Soda in Crystals,	1 0 0	0 6 0								
5.	Guano,	1 0 0	0 11 0	29,760	11,680	13 5 2 24	610 1	217 3	287	15 5 1	5 4 1
	Animal Charcoal,	1 0 0	0 4 0								
	Nitrate of Soda,	0 2 0	0 8 9								
	Gypsum,	1 0 0	0 1 6								

For remarks on this Table see page 247.—Ed.

II.—*Top-dressing Three-year-old Lea.*

Experiments of the comparative effects and values of various mixtures of Specific Manures as Top-dressings upon Three-year-old Lea saved for Hay. Top-dressed 18th April; cut 15th July; weighed green as cut, and again weighed when stacked, 25th July 1843.

Nos. of Dressings.	Description of Dressings.	Quantity applied per Imperial Acre.	Cost of Dressings per Imperial Acre.	Produce in Imperial Lbs. when cut green per Imperial Acre.	Increased produce in Lbs. when cut green per Imperial Acre from each Dressing.	Produce in Tons, &c. when cut green per Imperial Acre.	Produce when Stacked of Win Hay per Imperial Acre in Imperial Stones.	Increased produce of Win Hay from Dressing per Imp. Acre in Imperial Stones.	Quantity of Win Hay yielded by 1000 lbs. fresh cut of each kind of Dressing in Lbs.	Value of Hay per Acre when Stacked at 6d. per Stone.	Increased Value per Acre from Dressing.
		cwt. qr. lb.	L. s. d.	lb.	lbs.	tons cwt. qrs. lbs.	sts.	sts.	lbs.	L. s. d.	L. s. d.
1.	Nitrate of Soda,	1 2 0	1 6 3	20,800	8,480	9 5 2 24	668	306	450	16 14 0	9 0 0
	Animal Charcoal,	1 0 0	0 4 0								
2.	Nitrate of Soda,	1 0 0	0 17 6	18,400	6,080	8 4 1 4	525	217	400	13 2 6	5 8 6
	Common Salt,	1 0 0	0 1 6								
	Animal Charcoal,	1 0 0	0 4 0								
3.	Sulphated Urine,	1 2 0	1 7 0	16,800	4,480	7 10 0 0	494	186	412	12 7 0	4 13 0
	Animal Charcoal,	1 0 0	0 4 0								
4.	Sulphated Urine,	1 0 0	0 18 0	18,240	5,920	8 3 0 4	535	227	425	13 7 6	5 13 6
	Common Salt,	1 0 0	0 1 6								
	Animal Charcoal,	1 0 0	0 4 0								
5.	Guano,	1 0 0	0 11 0	15,360	3,040	6 17 0 16	411	103	375	10 5 6	2 11 6
	Animal Charcoal,	1 0 0	0 4 0								
6.	Guano,	2 0 0	1 2 0	24,960	12,640	11 2 3 12	704	396	395	17 12 0	9 18 0
	Common Salt,	1 0 0	0 1 6								
	Animal Charcoal,	1 0 0	0 4 0								
7.	Average of three Undressed Portions, one on the west, one in the middle, and one on the east side of field,	...	...	12,320	...	5 10 0 0	308	...	350	7 14 0	...

III.—*Top-Dressing Rye-Grass and Red and White Clovers for Hay.*

Experiments of the comparative effects and values of various mixtures of Specific Manures as Top-dressing upon Rye-Grass and Red and White Clovers, saved for Hay; Top-dressed 14th April; cut 14th July; weighed green as cut, and again weighed when stacked, 25th July 1843.

Nos. of Dressings.	Description of Dressings.	Quantity applied per One-Eighth of an Imperial Acre.	Cost of Dressings per One-Eighth of an Imperial Acre.	Produce in Imperial Pounds when cut green per One-Eighth of an Imperial Acre.	Increased Produce in Pounds when cut green per One-Eighth of an Imperial Acre.	Produce in Tons, &c. when cut green per Imperial Acre.	Produce when stacked of Win Hay per Imperial One-Eighth of an Acre.	Increased Produce of Win Hay from Dressing, per One-Eighth of an Imperial Acre.	Quantity of Win Hay yielded by 1000 lbs. cut of each kind of Dressing.	Value of Hay per Acre when stacked, at 6d. per Stone Imperial.	Increased Value per Acre from one Dressing.
		cwt. qrs. lbs.	L. s. d.	lbs.	lbs.	tons cwt. qrs. lbs.	sts.	sts.	lbs.	L. s. d.	L. s. d.
1.	Nitrate of Soda,	0 0 21	0 3 3	2,180	640	7 15 2 24	70	30	450	14 0 0	6 0 0
	Animal Charcoal,	0 0 14	0 0 6								
2.	Nitrate of Soda,	0 0 14	0 2 2½	2,320	780	8 5 2 24	66	26	400	13 4 0	5 4 0
	Common Salt,	0 0 14	0 0 2½								
	Animal Charcoal,	0 0 14	0 0 6								
3.	Sulphated Urine,	0 0 21	0 3 4½	1,720	180	6 2 3 12	50	10	412	10 0 0	2 0 0
	Animal Charcoal,	0 0 14	0 0 6								
4.	Sulphated Urine,	0 0 14	0 2 3	2,280	740	8 2 3 12	65	25	400	13 0 0	5 0 0
	Common Salt,	0 0 14	0 0 2½								
	Animal Charcoal,	0 0 14	0 0 6								
5.	Guano,	0 0 14	0 1 4½	1,780	240	6 7 0 0	50	10	387	10 0 0	2 0 0
	Animal Charcoal,	0 0 14	0 0 6								
6.	Average of two Undressed Portions taken from different places of the same Land,	...	... ...	1,540	...	5 10 0 0	40	...	[362	8 0 0	...

Remarks on Table No. I.—The mixtures in this Table were applied as top-dressings to the same field as the grasses experimented on in 1843, and the same remarks apply as regards soil and exposure. The whole field, extending to about nine acres imperial, was top-dressed and saved for hay, except the portion kept undressed for comparison, and was grazed with sheep till a few days before the dressings were put on. They all had the same effect in changing the colour to dark green, and imparting a vigorous growth; so much so, that the men found great difficulty in mowing it, from its great length and thickness, and its being much laid. It is also worthy of notice that, in the dressed portions of the field, the aftermath came away earlier and stronger, giving double the produce of the undressed, and has kept a large stock of Cheviot ewes since, without being diminished in vigour.

Remarks on Table No. II.—The field upon which these top-dressings were applied is a good sound loam of medium quality, subsoil a wet stiff yellow till; it is nearly level, and exposed on all sides. It was thoroughly drained some years ago, and is quite dry. It was subsoiled when last laid down, and is worth about 40s. of rent per acre. The sward is mostly composed of *Phleum pratense* and *Trifolium repens*, with a small proportion of *Lolium perenne* and *Poas.* It was grazed with sheep till within a few days of being top-dressed. After the dressings were applied, which was done during the time of rain, the grass came away very quickly upon all the dressed portions, and particularly in Nos. 1 and 6, which were most remarkable for strength and vigour, being taller than any of the other dressings, the Timothy being above three feet high. All the dressings had a good effect, and all of them changed the colour from a light to a dark green. No. 5 seems, however, to have been put on in too small a quantity, which, in using these dressings, is very often done, (from fear of burning the plants, or from mistaken economy,) as, from repeated trials, it has been found that by the addition of an extra half hundred weight the crop has been nearly doubled; and it also has been observed that, in general, the more compounded the dressing is the greater results follow its application.

Remarks on Table No. III.—The piece of ground upon which these top-dressings were applied was trenched out of lea, sixteen inches deep, in the spring of 1842, and sown down the same season, without farther preparation, with rye-grass and red and white clovers; it was cut once at the end of 1842. The soil is a medium loam, quite dry, and exposed on all sides. The grass was rather backward and thin upon the

ground in the spring, but after the dressings were put on, it improved rapidly, changing to a dark green colour, with a vigorous growth, and very thick sward. No. 1 came away earlier to maturity than any of the others, and to which (*i. e.* its maturity) I ascribe the greater weight of dry hay yielded, by 1000 lbs. of green cut, than any of the other dressed portions, the seed of this portion being quite ripe—the hay was also of a coarser quality than any of the others, Nos. 2 and 4 being of the finest quality of hay. The quantity of ground under each experiment was one-eighth of an acre imperial, the piece of ground not admitting of larger portions. Although upon a smaller scale than the other experiments, these experiments may be useful in shewing what may be done by judicious dressings upon the poorer lands of this country.

From having appended these remarks relative to the Tables, I can say little more regarding them; and it appears that, in the present state of our knowledge, it would be rash and premature to draw conclusions for the universal application of these substances upon every soil and situation. I may, however, remark from my experience, that many of these substances, when judiciously mixed and applied, will enable the cultivator to add greatly to his produce, and reap a clear profit to himself. I have found that the *nitrates* of *soda* and *potash*, when applied, either by themselves or in mixture to hay and potatoes, on every variety of soil, have always given a greater produce, and particularly from a mixture of these salts; while the application by themselves to grain crops is not beneficial, and is indeed injurious, particularly in a moist climate; for, though the growth of the straw is greatly increased, the sample of grain is lighter, and otherwise deteriorated in quality. In places far from the sea, *common salt* will in general be found advantageous as a dressing upon grain crops, and also upon grass for hay. Although it does not bring away a rush of growth like the nitrates, it will, in general, be found in such places that it will cause the grain to weigh more per bushel, and be of better quality in clearness of colour and plumpness, and the grass for hay, equal quantities of dressed and undressed being taken, to give most dry hay. *Soot* will be found to be beneficial as a top-dressing for grass intended to be saved for hay, and differs little in its effects from the nitrates; and its almost universal application in this part of the country to the hay crop goes to confirm that it is so. I, however, understand that the dealers in hay do not like the hay so well, and give a less price for it per ton. In applying it to grain and potato crops I have found its effects to be more evanescent than the nitrates. *Sulphates* and *muriates* of *ammonia* act in the same way, and have the same effect as the nitrates. The *sulphates* of *soda* and *magnesia* act differently, and in many cases will not pay

when applied to grain and potato crops by themselves. They are, however, of the greatest importance in mixture with the nitrates; only a small portion of them in mixture with these salts adds greatly to the produce of both potatoes and hay. From some experiments, on a very small scale, there is some reason to believe that *silicate* of *potash* might assist in correcting the tendency which grain crops dressed with nitrates of soda and potash have to lodge, but the difficulty of making the silicate, or procuring it at a moderate price, has hitherto prevented an extensive trial being made of it. There are also other substances, such as the *phosphates* of *lime* and *magnesia*, a mixture of which might, in certain cases, assist in bringing grain crops to maturity.

Guano, although not noticed in the Society's premiums, has been mentioned in the Tables. It has in all cases here been found an acquisition, and a most powerful auxiliary to farm-yard manure. It has been successfully applied here upon every description of soil and crop, both in the garden and farm; and after having used it for three years, and in this last year to every description of crop, to the extent of about ten tons, I can speak of its merits with perfect confidence, and am satisfied that it is one of the greatest boons ever conferred upon the cultivators of the soil. When it was used last year (1842) in growing turnips and potatoes on a part of a field of considerable extent, the grain crop of this year (1843) is equal, if not superior, to that where the same description of crop last year had forty cubic yards of the best farm-yard manure. It is also a universal manure; for it has been used with the greatest success as a top-dressing for grass and hay, as well as for grain crops, potatoes, and turnips. Used with a small portion of dung this season, (1843,) the heaviest crops of turnips, Swedish, yellow, and white, are now upon the land (in Nov.) The potatoes also of this season are remarkable for strength and luxuriance of growth where guano was used, and the crop nearly a half larger. Five cwt. of guano applied with moss, or other inert vegetable matter, has given a greater produce of both potatoes and turnips than thirty-five cubic yards of dung alone.

A good *artificial guano* may, no doubt, be made, should the foreign supply fail, or the price increase; and, to ensure this, a number of experiments should be made with mixtures as nearly resembling guano as possible, but the pure ingredients should, in all cases, be mixed by the farmer, to prevent adulteration. And to promote this object, the Agricultural Chemistry Association will be most beneficial when brought into practical operation.

EXPERIMENTS WITH VARIOUS FERTILIZERS. By JAMES LUMSDAINE, Esq., of Lathallan, Fifeshire.

No.	Crop 1843.	Manures.	Quantity per Acre Scots, One-Eighth of an Acre being employed.	Cost per Acre Scots, including filling, driving, spreading, sowing, and drilling.			Produce per Acre Scots. In grain.	In straw.		Progress and Results.
				L.	s.	d.	lbs.	sts.	lbs. Imperial.	
1	Sandy Oats, after Turnips	Farm-yard dung,	16 tons.	5	5	6	2432	330	12	Weight 42 lbs. per bushel; sown on 15th April after turnips, and reaped with the sickle on 26th September.
2	Do.	Foreign Guano,	2½ cwt. mixed with ¼th earth,	1	16	5	2368	322	12	Weight 42 lbs.; sown on same date after turnips, broad-cast, and reaped with the sickle on 26th September, although it was ready by four days earlier at least. It exhibited a greener and fresher appearance than No. 1, and maintained it throughout.
3	Do.	Johnston's Artificial Guano,	3½ cwt. mixed with ¼th of earth,	2	4	0	2216	336	0	Weight 42 lbs., sown and reaped as above, and co-equal with No. 2 in earliness and appearance.
4	Do. after Lea,	Top-dressing of Nitrate of Soda,	208 lbs.	2	4	9	3010	412	8	Weight 42¼ lbs. per bushel. The oats were sown on 11th April after a hay crop, and top-dressed on the 19th of the same month; heavy rains supervened on the 22d April, and in a few days thereafter the braird manifested superior verdure and vigour to the other parts of the field, which it supported throughout the season. The crop was reaped with the sickle on 3d October.
5	Do.	Top-dressing of Sulphate of Ammonia	208 lbs.	2	13	5	3104	448	0	Weight 42¼ lbs. per bushel. The same remarks apply as to No. 4, with which it kept progress, *pari passu*.
6	Do.	Nothing.	.. ..		..		2792	361	2	Weight 42¾ lbs. per bushel. It is somewhat remarkable that this unmanured patch, adjoining the two last, should be so far superior in grain and straw to Nos. 1, 2, and 3, manured with Dung and Guano; but perhaps the greater shelter of the park on which the oats grew, and their preference for lea to turnip ground, or the existence of some element in the land better adapted to the successful culture of that species of grain may account for this.
7	Dunlop Barley.	Farm-yard Dung.	16 tons.	5	5	6	2448	253	10	Weight 54 lbs. per bushel; sown on 20th April, after turnips. Was from the first inferior in appearance and strength to Nos. 8 and 10, but superior to No. 9.
8	Do.	Johnston's Artificial Guano.	3½ cwts. mixed with ¼th of earth,	2	4	0	2600	260	0	Weight 54 lbs. per bushel; sown on same date, broad-cast, after turnips, and harrowed in.
9	Do.	Rape-dust.	16 cwt.	5	3	0	2872	304	0	Weight 54 lbs. per bushel; Sown on same date, broad-cast, after turnips, and harrowed in. Inferior to Nos. 7 and 10 in healthiness and strength.
10	Do.	Top-dressing of Nitrate of Soda,	208 lbs.	2	4	9	2600	270	12	Weight 54 lbs. per bushel; sown on same date, broad-cast, after turnips, and harrowed in. Equal in vigour and appearance to No. 8.
11	Hunter's Wheat	Do.	208 lbs.	2	4	9	2408	358	4	Weight 61 lbs. per bushel; sown, after potatoes, on 24th October 1842; top-dressed on 19th April, and cut down with the sickle on 26th September 1843.

Experiments with various Fertilizers—*Continued.*

No.	Crop 1843.	Manures.	Quantity per Acre Scots, One-Eighth of an Acre being employed.	Cost per Acre Scots, including filling, driving, spreading, sowing, and drilling.	Produce per Acre Scots. In grain.	Produce per Acre Scots. In straw.	Progress and Results.
				L. s. d.	lbs.	sts. lbs. Imperial.	
12	Hunter's Wheat	Top-dressing of Sulphate of Ammonia.	208 lbs.	2 13 5	2416	349 2	Weight 61 lbs. per bushel, and top-dressing applied of same date. Much rain having fallen soon after the application of these top-dressings, the patches sown with them were easily cognizable by their healthy green appearance, particularly that with the Ammonia, and were fit for reaping at least five days before the rest of the field.
13	Do.	Nothing.	.. ..	..	2440	326 4	Weight 61 lbs. per bushels. The produce in grain was greatly superior to Nos. 11 and 12, but the yield of straw much less. Cut down with the sickle on 26th Sept.
14	Scotch Tares,	Johnston's Artificial Guano.	4 cwt., mixed with $\frac{1}{4}$th of earth.	2 10 0	unascertained.		The produce was not ascertained by weight, but its appearance indicated a much greater supply of nourishing succulent food than any portion of the rest of the field of similar extent. The tares were sown after oats on the 10th of May, and the fertilizers along with them broad-cast and harrowed in. No. 15 was inferior to No. 14.
15	Do.	Rape Dust.	8 cwt.	2 11 7	do.		
16	Pasture.	Top-dressing of Nitrate of Soda.	208 lbs.	2 4 9	..	..	A succession of heavy showers followed soon after the sowing of these fertilizers on 19th April, and the pasture manifested in about fifteen days thereafter an unusual degree of verdure and vigour, and length of pile, and an earliness by ten days than the rest of the field. It was devoured greedily by the cattle, and it was difficult to say which of the applications had the superiority.
17	Do.	Do. of Sulphate of Ammonia.	208 lbs.	2 13 5	..	..	
18	Do.	Irrigation with Foreign Guano.	80 lbs., mixed with 1280 gals. of water.	0 10 10	..	..	The irrigation was carried into effect on the 6th May, by means of a garden watering-pan, but the mixture was so much diluted and reduced in efficacy, in consequence of the heavy rains which supervened soon after its application, that no active result was perceptible.
19	Young Grass for Hay,	Top-dressing of Nitrate of Soda.	208 lbs.	2 4 9	..	Tron weight. 150 20	In consequence of the occurrence of frequent showers in two or three days after the application of these top-dressings, the grass exhibited much greenness and health, and was readily distinguishable from the rest of the field at a great distance, but the ammonia prevailed. The average length of the pile was nearly three feet, and was fit for mowing at least twelve days before the rest of the field.
20	Do.	Do. of Sulphate of Ammonia.	208 lbs.	2 13 5	..	185 18	
21	Do.	Nothing.	.. ..	..	..	133 18	The length of pile in this patch, which had nothing, did not exceed two feet, and was thin, but the hay crop was generally deficient in this part of the country.
22	Do.	Irrigation with Johnston's Gu.	80 lbs., mixed with 1280 gals. of water.	0 9 5	..	..	The irrigation was performed on the 9th of May, but, from the constant rains on the 12th and 13th of that month, the experiment shared the fate of No. 18.
23	Blue Don Potatoes,	Farm-yard dung top-dressed with Sulph. of Soda & Common Salt.	Dung 16 tons, Sulphate of Soda 144 lbs., Common Salt 72 lbs.	5 16 7	..	Imperial. 912 0	The potatoes were planted on the 3d of May, with the dung, after oats, and top-dressed with these salts on 28th June, upon appearing above ground, and were taken up on 18th October. The stems were much greener and stronger to the last than No. 28 with the dung alone.
24	Do.	Foreign Guano,	5 cwt. mixed with $\frac{1}{4}$th of earth.	3 12 10	..	760 0	Drilled in with the potatoes on 3d May, and taken up as above. Maintained its superiority in verdure over the other experiments through the season. The stems failed a fortnight before No. 28, and were all that earlier, and might then have been taken up if required.
25	Do.	Johnston's Artificial Guano,	7 cwt. mixed with $\frac{1}{4}$ of earth.	4 7 8	..	792 0	Drilled in and taken up as above. Did not at any time equal No. 24 in appearance or earliness.

Experiments with Various Fertilizers—*Continued.*

No.	Crop 1843.	Manures.	Quantity per Acre Scots, One-Eighth of an Acre being employed.	Cost per Acre Scots including filing, driving, spreading, sowing, and drilling.	Produce per Acre Scots. In grain.	Produce per Acre Scots. In straw.	Progress and Results.
				L. s. d.	lbs.	sts. lbs. Tron.	
26	Blue Don Potatoes.	Johnstone's Art. Guano and Dung.	Johnston's Guano 3½ cwt. with ¼th of earth, dung 8 tons.	4 17 2	..	825 10	Drilled in and taken up as above. Corresponded in appearance and progress with No. 28.
27	Do.	Dung and Rape-dust,	Dung 8 tons, and Rape-dust 8 cwt.	5 3 9	..	813 2	Do. and do. Excelled No. 28 in appearance.
28	Do.	Farm-yard dung,	16 tons.	5 5 6	..	832 0	Manured, and planted, and taken up as above. Owing to the wetness and low temperature of the early part of the season, and the early frosts in October, in some degree the potato crop proved very deficient in quantity, amounting hardly to half a crop, and some farmers did not get back even their seed.
29	Aberdeen green-top yel. turnip	Do. do.	16 tons.	5 5 6	..	2183 6 of bulbs.	Manured and sown after oats in drills on 19th June, and taken up on 26th January 1844, when they had attained their maximum size, having been favoured by the unusual mildness and openness of the season.
30	Do.	Bone-dust,	20 bushels.	3 14 5	..	2320 0	Sown after oats on 19th June in drills drawn very light, and covered in with the mould, and the turnip seed drilled in as above. These were ready for singling out earlier than No. 29.
31	Do.	Do. and Dung.	Dung, 8 tons, and bone dust 10 bush.	4 11 0	..	2580 0	Manured after oats, and drilled in on 19th June very lightly, and covered in, and the turnip seed drilled in. Excelled No. 30 in appearance.
32	Do.	Foreign Guano.	4 cwts. mixed with ¼th of earth.	2 13 5	..	3013 10	Drilled in lightly after oats on 19th June, and covered in, and then the seed drilled in. Took and kept the start of all the fertilizers.
33	Do.	Do. and Dung.	Dung, 8 tons, and guano 240 lbs. mixed with ¼th earth.	4 4 5	..	2840 0	Manured and drilled in lightly on 19th June after oats, and covered, and the seed drilled in. Had much the same appearance as No. 32, but inferior to it in every other respect.
34	Do.	Johnstons' Artificial Guano.	552 lbs. mixed with ¼th of earth.	3 1 10	..	2016 0	Drilled in and sown as above. Did not come away so rapidly as No. 33.
35	Do.	Do. and Dung.	Dung, 8 tons, and artificial guano 276 lbs., mixed with ¼th earth.	4 4 0	..	2176 0	Manured and drilled in as above. Superior to and earlier in singling out than No. 34.
36	Do.	Rape-Dust with Nitrate of Soda and Common Salt.	Rape-dust, 16 cwt. Nitrate, 144 lbs. Salt, 72 lbs.	6 15 8	..	1760 0	Drilled in and sown as above. Equal to No. 32 in appearance, and next to it in earliness.
37	Do.	Gypsum and Sulphate of Ammonia	Gypsum, 4 cwt. Ammonia, 208 lbs.	3 13 11	..	..	Drilled in and sown as above, but braided very irregularly, and failed.

No. 32 gave the largest bulbs, then No. 3[illegible], and next No. 29. The turnips were topped and rooted before weighing so that the weight of the bulbs only is given in the column of produce.

Summary of Conclusions deducible from the above premises.

Oats.—In respect of this article of produce, it is observable that the nitrate of soda gave 608 lbs. more grain, and 82 lbs. more straw, and the sulphate of ammonia 672 lbs. more grain, and 118 lbs. more straw, per acre, after a hay crop, at less than half the expense of farm-yard manure, renewed after turnips; thus proving the great superiority of both of these fertilizers, but especially of the ammonia. It farther appears that the ground in a natural state, after hay, is much more beneficially acted upon by these mineral fertilizers than by the higher order of animal manures after a turnip crop.

Barley.—Here the rape-dust beat the farm-yard manure by an excess of 424 lbs. of grain and 51 lbs. of straw, whilst the artificial guano and nitrate of soda maintained an equal efficacy; but from the expense attending these being only two-fifths of the cost of the rape-dust, the preference is due to them.

Wheat.—In this case the mineral fertilizers are at a discount in point of grain produce, though superior in yield of straw, to that which got nothing. There appears, therefore, no encouragement for a repetition of these applications.

Tares.—There is no reason to conclude that the greater proportion of produce of this article would repay the expense of the fertilizers employed.

Pasture.—Here it is quite problematical whether the earlier maturity of the pasture by ten days would, in upland and late districts, be sufficiently compensatory, supposing the outlay to be essentially necessary, in consequence of the expenditure of the winter keep.

Young Grass for Hay.—The conclusion here follows that the sulphate of ammonia might be profitably employed as a top-dressing in preference to nitrate of soda; and, from its earlier maturity by twelve days than the patch which got nothing, the after-math would be much earlier, and proportionally productive.

Potatoes.—The inference in this case is, that the patch with the farm-yard dung, and sulphate of soda, and chloride of sodium, or common salt, takes the lead; next to it that with the farm-yard manure by itself; then those with Johnston's guano and dung, and dung with rape-dust; and last of all, the two portions with the foreign and artificial guanos by themselves, which are equal in merit nearly, with reference to cost and produce.

Turnips.—Under this head the great superiority of the foreign guano is particularly prominent in the production of 530 stones more of bulbs than the farm-yard dung alone, at little more than half of the expense. Next comes the mixture of

dung with foreign guano, yielding 357 stones more than dung alone, at an expense of a guinea less per acre; then follows the combination of dung and bone-dust, giving 97 stones more than farm-yard dung alone, at 14s. less money. The bone-dust by itself comes next, followed by the artificial guano by itself also, and in combination with farm-yard dung. The rape-dust, with nitrate of soda and chloride of sodium, may safely be repudiated, both from the scantiness of the produce and the expense incurred. In the absence of farther information, I would, in the meanwhile, ascribe the total failure of gypsum with sulphate of ammonia to the insufficient supply of gypsum.

The foreign guano cost 14s. per cwt.; Johnston's artificial guano, 12s. per cwt.; farm-yard dung, 6s. per ton; nitrate of soda, 2½d. per lb.; sulphate of ammonia, 3d. per lb.; rape-dust, 6s. per cwt.; dry sulphate of soda, 7s. per cwt.; chloride of sodium, (coarse salt, such as is used by fishermen,) 1s. 4d. per cwt.; bone-dust, 3s. 6d. per bushel (?); gypsum, 4s. 8d. per cwt.; driving dung from the dung-court to the experimental fields, sixteen tons per day, 7s.; assisting to fill the carts, one man, 1s. 6d. per day; spreading dung, 1s. per acre; sowing broad-cast, 5d. per acre, with the exception of the rape-dust in No. 9, which, being of great bulk, cost 8d.; drilling, 10d. per acre; driving manure (dung excepted) from an average distance of eight miles, 7s. per ton, and one toll 10d.

It being desirable to test the comparative merits of the foreign guano and Professor Johnston's artificial substitute, 631 lbs. of which he states to be equal in efficacy to 4 cwt. of the foreign material, this proportion has accordingly been kept in view in the experiments Nos. 2 and 3, and 24 and 25, and is equally applicable to Nos. 32 and 34; for if 552 lbs. of the artificial (as in No. 34) yield 2016 stones of produce, 631 lbs. will give 2304 stones, being 709 stones and 10 lbs. less than the product of the foreign article per acre Scots. It is essential to state that the locality of these experiments has a southern exposure, is placed at from 482 to 490 feet above the sea level, and is cultivated under the four years' course of oats after lea, followed by green crop or bare fallow, and then barley or wheat, and a crop of hay. Upon analyzing the soil, I found it to consist of a considerable proportion of alumina, some carbonate of lime, and silica; and 400 grains of it, when exposed to a red heat, lost one-eighth of organic matter and aeriform products, so that 350 grains of inorganic materials remained behind.

I observe, upon consulting my meteorological register, that the quantity of rain which fell from the 1st of April last year to the end of October, whilst these experiments were under progress, amounted to 23⅛ inches, or a monthly average of 3¼ inches.

COMMUNICATION from W. F. L. CARNEGIE, Esq., of Kinblethmont, Forfarshire; with an ANALYSIS of PEAT-ASHES by Mr R. COLVILL, Forfarshire.

I BEG to forward herewith a paper on a subject of sufficient interest, I think, for the consideration of the Society's monthly meetings. As the production of a practical farmer, who has devoted much of his time (at his own expense) to similar inquiries, it will serve also, I am sure, as a pleasing indication of the progress now making in studies which are generally acknowledged as likely to prove of so much utility to agriculture.

It is some years since I made experiments, on a considerable scale, on the peat-ash of this neighbourhood, (prepared by burning the peat by itself.) These experiments were not satisfactory, although an analysis, professionally made for me by an eminent chemist, was calculated to lead to an opposite conclusion. With a view, if possible, of discovering the cause of the failure, I made a visit to Berkshire, and had there an opportunity of seeing the method of preparing the peat-ash of that district. In the botanical composition of the peat itself I could see little or no difference from that of our own; but I observed that, on burning it, a very considerable portion of the soil there, incumbent on the peat, was burned along with it. This consisted in great part of the debris of the adjacent hills mixed with mud. It occurred to me, therefore, that some chemical combination, calculated to alter the constituent properties of the peat-ash might take place in this operation, and that, by imitating the process here—by burning the peat along with the marl, which is so generally found to accompany it—a favourable result might ensue. Although sufficiently provided with peat, I had not access to marl or other calcareous matter to enable me to test this on an extended scale, but some limited experiments I made were very satisfactory, and tended to shew that, as a top-dressing for grass, the preparation would be found very useful. I have not applied it to anything else. In this stage of the matter, Mr Colvill very obligingly offered to make the examination, of which the following is an account; and, as it promises so well, I forward it to the Society, in the hope that some one more favourably situated than myself may be induced to give it a fair trial. I have better reason than my own knowledge for believing that considerable reliance may be placed on Mr Colvill's analytical accuracy, and I *know* that he has spared no pains upon the inquiry. Mr Charles Lyell informs me that about a century ago the accidental visit of a gentleman from Berkshire to the district, in Holland, where peat-ash had been an article of commerce for near a century before that, had led to the discovery, which had been so profitably followed up in England to the present time.

What follows is from Mr Colvill.

Having succeeded in subjecting the Berkshire peat-ash, the Kinblethmont peat-ash, and its subjacent marl, to a pretty accurate and rigid analysis, I take the liberty of transcribing my results.

Besides these separate results, in consequence of the ash of the Kinblethmont peat being so opposed in its effects to the Berkshire peat-ash, and in compliance with what you particularly wished, I have tried whether the poisoning effects of the former might not be removed by burning the peat in contact with its marl, and I am happy to say that the result has been satisfactory; for the construction and classification of the salts are entirely changed, as this investigation will clearly shew.

Farther, this change being in accordance with the adopted theories of agricultural chemistry, warrants me in pronouncing it to be beneficial, and the ash to be not only now freed from any noxious quality, but possessed of all the fertilizing properties of that used in Berkshire.

I have also taken the liberty to append the chemical actions under review, where they appear consonant with known processes of agriculture. The Kinblethmont peat left 12 per cent. of ash.

The following is the tabulated analysis of 200 parts of the Berkshire peat-ash, 200 parts of the marl, and 200 parts of the Kinblethmont peat-ash.

		First Analysis. Berkshire.	Second. Marl.	Third. Kinblethmont.
	Very undecomposable Siliceous Matter,	28	7.75	82.75
	Silicate of Lime difficult of decomposition,	...	...	67.
	Moisture,	3.	76.	...
	Vegetable Matter,	1.5	43.25	...
Soluble Matter.	Sulphate of Lime,	3.5	...	...
	Lime,	...	...	.5
	Carbonate of Soda,	...	...	.125
Muriatic Acid Digestion.	Carbonic Acid,	65.	12.	...
	Silica,	.25	...	...
	Lime,	72.25	55.	21.
	Magnesia,	5.5	3.	1.5
	Soda,	2.5	1.5	1.5
	Potassa,	.5	...	.25 nearly.
	Oxide and Peroxide of Iron,	10.25	1.25	15.
	Oxide of Manganese,	.25	trace.	.75
	Do. do. separated from the Phosphate of Iron, but not in union with Phosphoric Acid,	...	...	.25
	Alumina,	1.	.25	4.
	Phosphate of Magnesia,	1.	...	...
	Do. of Lime,	.5	...	...
	Phosphuret of Iron,	...	...	.75
	Phosphate of the Oxide of Iron,	...	...	.875
	Sulphate of Lime. The Sulphuric Acid of which has been in combination with Iron,	..	...	.75
	Sulphuric Acid latterly separated from Soda, but it also had been in combination with Iron,	...	...	1.
	Titanate of Iron,	5.	...	...
	Loss, including a distinct smell of Hydrosulphuric Acid,	...	...	2.
		200.	200.	200.

The great similarity of ultimate elements in the first and third analysis, gave me considerable encouragement to try your views. In fact, the fear which Sir H. Davy expresses in his Agricultural Chemistry that peat-ashes, in general, would be found to have those parts awanting which give the fertilizing character to the Berkshire and Wiltshire—being now by this comparison entirely removed. No other reason could be held for the impoverishing or poisoning effects of the Kinblethmont peat-ash than the character of its sulphur and phosphorous, in being united as elementary combinations with iron, or as oxysalts with the oxide of iron; for, according to Sir Humphry Davy and succeeding chemists, both such combinations of sulphur are considered to be prejudicial; and only so, as Sir Humphry Davy fully expresses, in being combined with iron, and not, as Sprengel and Liebig consider, by such combinations constituting deoxidating salts. At least a comparative experiment has given me a greater crop from prepared sulphuret of calcium than from its equivalent quantity of sulphate of lime. But the sulphuret of calcium exerts a greater deoxidating effect than the sulphate of the oxide or sulphuret of iron. Therefore it cannot be through their deoxidating effects that such salts are impoverishing to land, but simply that such salts are poisonous to plants; and, according to Sprengel, the like combinations of phosphorus with iron are not only similarly prejudicial, but he is inclined still farther to suppose that the phosphuret of iron exerts an immediate effect in producing rust on wheat.

Seeing, therefore, the results of the separate analysis, it now assumed a very likely appearance that such a beneficial effect might be produced by burning, as you proposed, the peat-ash in contact with the marl; and, accordingly, on burning 480 parts of marl with 200 parts of the Kinblethmont peat-ash, I found the remainder to weigh 432.5, and to consist of

Siliceous matter,	168.
Carbonic acid,	66.5
Lime,	153.
Magnesia,	8.75
Soda,	5.25
Potassa,	Trace
Oxide, almost all peroxide of iron,	17.5
Manganese,	1.75
Alumina,	4.125
Phosphate of Lime,	2.
Do. of Oxide of Iron,	.5
Sulphate of Lime,	3.
Loss,	2.125
	432.5

The phosphorus and sulphur now fully oxidated, and almost all in union with lime; the most remarkable thing being, that the

same change of character was not produced by the already existing lime in the peat-ash, but required the great excess of the marl, and can only be accounted for by the action of all alkalis tending to produce oxidation when oxygen is present, and the large quantity of lime being more intimately connected with the salts.

Now it naturally occurrs, seeing the large quantity of carbonate of lime which would be added to the soil under the application of this ash, would not the addition of mild lime be as beneficial? To that I am unable to reply, except in this, which is certain, that all analyses of limestones have failed to detect the phosphoric or sulphuric salts, or at least, as Professor Johnston shews, the phosphoric salts only in traceable quantities; and from an analysis of a limestone of this county, I did not meet with either of the salts, but they might have been overlooked, by my making the lime the principal object of analysis. But, moreover, the two ashes being only under consideration, and now found to contain nearly the same per centage of constituents, no reason appears why they should not produce equal effects, and be in all manner similarly applied; and, finally, such a method of ameliorating the Scottish peat-ash only waits for a practical affirmation to raise their character from being poisonous to becoming one of the cheapest and most useful auxiliaries in the hands of the farmer—to be, in truth, equal to what Morton affirms is capable to increase the clover crop fully one-fifth.

I would only now still farther beg to connect this investigation with the process of paring and burning, as appearing to illustrate chemically some of the good results produced by thus treating cold clay lands. Although, in the opinion of Sir H. Davy, paring and burning chiefly consist in producing physical effects, such as diminishing the adherence and tenacity of clays, and destroying inert and useless vegetable matter, still the relative value of the ultimate elements being now better understood, and in consequence more necessitously searched for, leads one to suppose the change of physical character not to be all the improvement produced, but that a change in the character of the soil's salts would be found to be the results of a searching examination; for, even at that time, Sir H. Davy appears to have been inclined to admit that a beneficial chemical result was also part of the theory of the action, and if so, then, as resulting from the view now illustrated, the process of paring and burning is, as some already maintain, most efficacious on such soils when calcareous matter is present, and, when absent, that it should be applied.

I considered these remarks might not prove uninteresting, especially to those who may be unacquainted with the chemical arrangement of matter.

ON THE COMPARATIVE MERITS OF DIFFERENT MODES OF REAPING GRAIN.

By Mr JOHN TAYLOR, Farm-Overseer, Corsiestone, nearly Huntly, Aberdeenshire.

IN experimenting for the purpose of ascertaining the comparative merits of different modes of reaping, every mode must be tried under equally favourable circumstances—must get a *fair* trial—otherwise just conclusions respecting them cannot be arrived at. It is necessary that the reapers with the sickle and the scythe be alike dexterous with their respective implements, and that these implements be of the most approved description. It is rare, however, to find a band of reapers alike skilful in two or more modes of reaping—indeed hardly possible; but as I have employed reapers, and been practically engaged in it myself, in a district in which the sickle was in general use, and in that in which the scythe was exclusively employed, and also where the scythe was only in the course of being introduced, I humbly conceive that I may be able to make a report on the subject containing some remarks that could have only been suggested by practical experience and minute observation.

I shall consider the comparative merits of reaping by the scythe, and smooth and serrated sickles, in regard to binding, winning, carrying, stacking, and thrashing corn.

1. In regard to *Binding*.—The average number of sheaves, of an average crop of oats or barley, that one man can bind and stook in one day of ten hours, by these three modes, differs thus :—

Of sheaves reaped by the scythe, ...	1500
Of sheaves reaped by the smooth sickle, ...	1200
Of sheaves reaped by the serrated sickle, ...	1200

This difference is accounted for, *first*, by the mown sheaves being in regular rows of considerable length, the binder loses no time in moving from row to row, as in binding to shearers on two or three ridges; and, *second*, by mown stooks not requiring to be hooded, (covered with inverted sheaves,) owing to a peculiarity in their form shortly to be noticed, which makes them more easily and quickly erected than shorn stooks, as these require to be hooded. In practice, however, the binder binds less in a day to the scythe than to the sickle, because he binds to but one scythe, and the latter to six shearers, who reap more in a day than one scythe; but the binder to the scythe, if the crop be good, finds plenty of employment in assisting the gatherer in

making bands. I have in several instances bound and stooked 1680 sheaves of oats, containing $19\frac{1}{2}$ quarters of grain cut by the scythe, and of sheaves cut by the sickle 1360; and reckoned the latter decidedly the harder day's work. The amount of work that a binder can perform in a given time varies with the nature and luxuriance of the crop. He can do more of soft than of hard straw, and of a luxuriant than of a poor crop, because, in the last instance, he has less space to walk over from sheaf to sheaf, and also to complete the stooks.

Sheaves reaped by the smooth and serrated sickles in the usual way are equally easily bound; but by the mode of reaping by the former, termed *cuffing*, the sheaves are not so neat, and the binder's work is more difficult; the sheaves requiring some dressing, and numerous fallen heads to be lifted up. Therefore, though a man may, and commonly does, bind as many sheaves in a given time, reaped by this, as by the usual mode, it must be by greater exertion, or else the work will be imperfectly done.

2. In regard to *Winning*.—The prevalent opinion is, that grain reaped by the scythe is sooner ready for carrying than that reaped by either description of sickle, and my own experience is corroborative of this opinion. On a farm in Kincardineshire, of which I was for many years manager, part of the crop was reaped by the scythe and part by the smooth sickle, and I uniformly found that the part cut by the sickle required one-fourth more drought to fit it for the stack-yard than that cut by the scythe. Of a field of oats reaped on the 19th September 1839, the part cut by the scythe was stacked in good condition on the ninth day after, but that cut by the sickle was unfit for stacking until it had been twelve days in the stook. The situation of the field and farm in question was low, and sheltered by woods, and, during the period referred to, the drought was nearly uniform.

In regard to winning the work of the smooth and serrated sickles, if done in the usual way, is quite the same. Sheaves reaped by the smooth sickle by cuffing (viz., striking with the sickle so as to cut and gather a sheaf together without grasping every cut with the left hand) have the advantage of being less compressed than if reaped in the usual way, but want the peculiarities of form which contribute to the winning of mown sheaves.

Once for all, I may here remark of cuffing, that no more work can be done by it than by the ordinary mode, though it is easier for the reapers, as they require to stoop less, which is its only recommendation. I have never employed any cuffers myself, but have several times seen them at work.

As far as either my experience or inquiry goes, what I have already stated is the relative time required for winning mown

and shorn stooks; and sometimes I have found the difference of great importance. The latter part of the harvest of 1841 was remarkably wet, by which the outstanding crops were much damaged. On the 28-9th of September of said year, I had thirty acres of oats carted and stacked, which had been cut by the scythe the preceding week. On the evening of Wednesday 29th, it began to rain, and continued very rainy for twelve days, during which harvesting was at a stand still; and had the produce of those thirty acres been reaped by the sickle, it would have unquestionably been exposed to these twelve days' rain, and, of course, thereby much deteriorated.

In investigating the cause or causes of the difference of mowing and reaping, in regard to winning, the following peculiarities have particularly attracted my notice:—1, That, in a great majority of cases, and especially on narrow ridges, the straws composing a sheaf vary considerably in length. 2, That all the straws in sheaves, reaped by the sickle, reach to the bottom, or stubble end; and, therefore, including all the short straws within the sheaf, require the bands to be passed round near the bottom. 3, That binding in this way retards the process of winning in two ways—by compressing that part of the sheaf which most requires exposure, so as to render it almost impenetrable to the influence of sun and wind; and, by expanding its corn end so much, that when stooked, the stooks were almost as broad at top as at bottom; and, to defend these from rain, require hood-sheaves, which retard the winning of the grain. 4, That sheaves reaped by the scythe are even, or nearly so, at the top, or corn end, and, to include all the short straws, require the bands passed round a little below the ears of corn. 5, That binding near the top expands the bottom, and gives the sheaf a tapering form from bottom to top; for though the straws are more numerous at top than at bottom, they are much smaller, more compressed, and consequently occupy less space. 6, That, when set up, the ridge of the stook is very acute, leaving the least possible admission for rain, and therefore requires no hoodsheaves; and 7, That, after heavy rain, stooks reaped by the scythe are sooner dry than those reaped by the sickle, because the wet naturally sinks toward the bottom of the sheaf, but the former, being open, allows it quickly to escape by evaporation, while the latter, keeping it tight within the band, dries slowly.

3. In regard to *Carrying and Stacking.*—As has already been remarked, mown sheaves are closer and firmer at top than shorn ones; and on this account lose less grain by shedding than the latter, in the processes of carting and stacking. By observation, I am quite satisfied that this is the case, but cannot say precisely to what extent, nor could it be easily ascertained.

Sheaves cut by the sickle are even at the stubble end, and, therefore, a stack wall is easier built of them than of mown sheaves, and has a more handsome appearance; but, being close, excludes the air from the interior. A stack wall of mown sheaves is rough but open, and can be put up with safety *in a state of dampness, which would be destructive to shorn sheaves.* When a crop is reaped with the scythe by inexperienced hands, a considerable quantity of grain is exposed on the outside of the stacks, owing to the straws having been irregularly laid into the sheaves; but with dexterous mowers, the quantity thus exposed will be very trifling, as it only happens when the wind blows in a direction contrary to that in which the crop has been laid by a previous storm, and not sufficiently strong to turn it completely back, that the mower finds it impossible to make an even swathe.

A case of this kind rarely occurs, and when it does, the grain exposed in consequence need not be lost. A man with a scythe-blade fixed to a fork-shaft can dress a stack in an hour, spreading a sheet of canvass at the bottom to receive the heads of grain as they are cut off.

With respect to carrying and stacking the work of the smooth and serrated sickles, provided they have been alike carefully performed, they are very little dissimilar.

4. In regard to *Thrashing.*—Of mown and shorn grain, the flailman gives preference to the latter, because the grain is more exposed to the action of his implement, and is, therefore, more easily beaten out. This is caused by the peculiarity of reaping noticed under the head of winning. In ordinary cases a flailman can thrash about 10 per cent. more of shorn than of mown sheaves, and if the mowing has been improperly performed, the difference will be still greater. A good machine will thrash the one kind as effectually and expeditiously as the other; but mown sheaves are more difficult to part asunder than shorn, and although a man may feed both kinds equally fast into the machine, the former fatigue him more, as they require greater force to separate them.

As to thrashing the work of the smooth and serrated sickles, it is much the same; however, by the smooth sickle, some straws are apt to be laid in a wrong direction, and usually some rakings are left, and a *feeble* or imperfect machine will not thrash the rakings and inverted straws perfectly—and, to thrash these well, they must be put twice through the machine. By the serrated sickle, fewer straws are in a wrong position, and there are no rakings to be dealt with.

5. *The amount of work performed by different modes of Reaping.*—Having had many opportunities of ascertaining this point in various parts of Scotland, I shall here state what I have found to be the average amount of work performed by a band of reapers

with scythes, and smooth and serrated sickles—the reapers being in every case thoroughly trained to their respective modes of reaping. Seven is the most convenient number, as six reapers require one binder, and two mowers require five attendants, viz., two gatherers, two binders, and one raker. Seven reapers, then, will reap of an average crop in one day of ten hours:—

	Of Wheat.			Of Oats or Barley.		
	Acres.	Roods.	Poles.	Acres.	Roods.	Poles.
By the scythe,	2	3	0	4	0	20
By the smooth sickle,	1	1	18	2	2	10
By the serrated sickle,	1	0	8	2	0	10

This shews a considerable difference in favour of the scythe, although I have stated the average extent of land reaped by expert shearers when working briskly. In this district, it is thought no great feat for one man to mow three acres of a light crop in one day, in fact, I have repeatedly done so myself, but with very great exertion; but of a fair crop two acres, or very little more, is as much as can be done; the mower might do more, but this is as much as two attendants can gather, bind, and stook, and a third cannot be employed to advantage. I cannot take leave of this part of the subject without remarking that I deprecate the overtasking of young women in gathering heavy crops as a cruel oppression. Half the number of those hired to gather not being habituated to active employment, it is unreasonable to expect them to do as much at an occupation, perhaps the most active that falls to the lot of women in field labour, as those enured to it. To alleviate this hardship, for the first week of harvest, especially if the weather be warm, my plan is to make the reapers rest twenty minutes whenever I perceive it requisite, and I find it a plan both humane and profitable.*

6. *Comparative Merits of Different Modes of Reaping.*—The preceding facts shew a difference in favour of reaping by the scythe, with the exception of thrashing, which is comparatively an unimportant point, as the quantity of grain thrashed by the flail in Scotland is very trifling. There is another and somewhat serious objection urged by the opponents of mowing, namely, that more is left by it for the rake than by shearing, and that that so left is either lost altogether, or deteriorates the rest of the crop if mixed amongst it. This, I admit, is, in many instances, true enough; but is it an unavoidable result of reaping

* It deserves to be noted that the food of the reapers, whose work has been stated above, consisted of oatmeal porridge and milk for breakfast and supper, and potatoes for dinner, *with abundance of oat-cakes and milk at every meal.* All whom I know that have harvested in "the south," assure me that they cannot do so much work there, because the diet consists of porridge and milk, with bread at dinner only.

by the scythe? Assuredly not. I beg to submit that I have employed mowers for ten harvests, and that the quantity left to the rake has not averaged more than 4½ per cent., which is little more than what is commonly left by the smooth sickle, and I have neither left the rakings to rot in the fields, nor spoiled the rest of the crop by them; and I know no good reason why others should do so.

When a crop is reaped by the serrated sickle, there is nothing left to the rake, but this is its only recommendation; it is otherwise a laborious and expensive mode of reaping, and has now, with few exceptions, given place to the smooth sickle and the scythe. As it is now little in use, few can reap with it without uprooting part of the straw. Last year, 1842, several southern farmers of my acquaintance got serrated sickles to their reapers on account of their crops being so thin that more was cut by the smooth sickle than could be caught in the hand, by which too many straws fell to the ground; but the reapers, not being accustomed to such sickles, pulled up so many straws by the roots, that the stacks looked as if the whole crop had been pulled, the roots, being outmost, concealed the ends of what had been cut. I am inclined, however, to think that much of the pulling had been intentional on the part of the reapers, for those who have reaped with smooth sickles dislike serrated ones exceedingly, finding them much stiffer to work with.

With respect to learning to reap with the scythe and either kind of sickle there is this difference. Beginners with the sickle very soon learn to reap neat enough, but are defective in point of speed. Beginners with the scythe very soon learn to reap fast enough, but are defective in point of neatness.

Both mowers and gatherers require some instruction, besides a few days' practice, before they can do their work properly; even although the former be good mowers of hay, they will require some practice in mowing grain, to enable them to lay it evenly in the swathe; but, if they are anxious to learn, a very short time will suffice;—and until mowers and gatherers are both expert, their conjoint work will appear rough and defective.

7. *The most Approved Mode of Mowing.*—As the most approved mode of reaping by the scythe is not very well understood throughout Scotland, I beg to offer a few hints on it. The mode practised in the counties of Aberdeen and Banff is decidedly superior to any other I have seen or heard of elsewhere, and may be described thus:—When the crop is not laid and entangled, the mowers follow each other with their backs, or rather their right shoulders, to the wind, following the inclination of the crop, without regard to the direction of the ridges, and commence always on the left side of the field, so as to cast the swathes *from* the

standing corn; but if the crop be laid in various directions, every mower takes a separate ridge. By this arrangement every one can cut in the most advantageous direction without being obstructed by the others. But, whenever the crop will admit of it, the mowers follow each other, taking a swathe seven and a-half feet wide. Every mower is followed by a woman, who gathers the swathe into sheaves, makes bands, and places the sheaves on them; and every woman is followed by a man, who binds and stooks the sheaves; and lastly follow one or more rakers, according to the number of mowers. The rake in general use has a wooden head seven feet in length, furnished with curved iron teeth; the shaft is about the same length, with a ring fixed in it two feet from the head, to which a belt is attached which passes over the shoulder, and across the breast of the raker, by which the rake is dragged backwards and forwards *across* the ridges, so as to dip into the furrows, and is always emptied close to the standing corn. With this implement a man can rake to four scythes, if the ground be smooth. During the time the mowers are sharping their scythes the rakings *are put into sheaves by the gatherers*, *bound and stooked* by the bandsters, *apart* from the rest of the crop.

As has been already remarked, a man requires some practice to enable him to mow grain properly; and if this part of the work be awkwardly performed, it will mar all the subsequent operations of harvesting. If a mower has learned to wield the scythe among hay—to give a good edge to the scythe and preserve it—and to leave a uniform stubble—all that is required more to constitute a good mower of grain is the art of laying it in one direction. In mowing, the scythe makes a circular sweep into the corn; every cut or swing of the scythe clears a piece of ground in the form of a crescent. The mower should keep his feet well forward to the standing corn, which saves him from stooping, and gives him the greatest possible command of his implement; he should move freely and steadily along, and swing his scythe no further to the left than what is necessary to *cut out the point*; and, above all, let him endeavour to make equal strokes—to make crescents as nearly uniform as possible, for thereon depends the even laying of the grain. This advice deserves to be reiterated upon the inexperienced mower.

Gathering the swathes into sheaves is mostly done by women; and though the process seems very simple, it nevertheless requires an *art* which few are clever enough to learn without instruction, and none to excel in without considerable practice. Last year I had an opportunity of seeing reapers at work with the scythe in Berwickshire, the Lothians, and various other places south of the Grampians; I saw a good many tolerable scythesmen, but, south of the Forth, not one gatherer that I would have employed otherwise than

as a learner. They seemed not to have the least idea of how gathering should be done, for every one, while in the act of gathering a sheaf, stood alongside of it with her petticoat tied to her knees; whereas a good gatherer invariably stands at the stubble end of the sheaf with her petticoat down to her ankles: indeed it is such an important auxiliary in keeping the ends of the sheaves even, that, when men gather, they supply its place by a sort of long apron. The gatherer's duty, when once learned, can be as easily performed in the way which most facilitates the process of binding, and all subsequent operations, as the reverse. That no small parcels of corn be unlifted, the left hand should be most used in gathering, and every sheaf laid down with its corn end toward the point where the swathe commenced, and its centre of gravity placed directly over the band—both ends of which should be left clear. Inattention to these particulars, increases the labour of the binder—he can neither do his own work well nor give the gatherer any assistance.

To facilitate the winning and stacking of the grain, the sheaves should be made uniform in size, with bands no thicker than just strong enough to bind and keep them firmly together.

In binding mown grain, the main error practised by those who have been accustomed to bind to reapers is pursuing the old plan of binding near the stubble end. This should be observed, and a different mode enforced, or else the advantage of mowing in regard to winning will be entirely lost, and, if wet weather ensue, converted into a positive evil.

The quantity and treatment of the rakings seem to me the most grievous evil of inexpert assistants to mowers. I have seen about ten per cent. left to the rake, and this made into wisps, (the worst imaginable form for winning, for the rain gets into them, and never gets out again,) and a wisp placed at each end of every stook, as if designed to hinder the winning of the stooks as much as possible by preventing ventilation; and when the stooks are lifted for the stackyard, the wisps, being found in bad order, are either tossed aside or else taken out to dry, and, before a fitting opportunity arrives for securing them, are either rotted by the rain or scattered by the wind, and in either case destroyed by birds, and thus incur very considerable loss. Now those who manage well, leave not half as much to the rake, and what they *do* leave is treated in quite a different manner; being put into sheaves, instead of wisps, it is found in as good order as the rest of the crop, apart from which it can be conveniently stacked and thrashed, which is found the most advantageous plan, because rakings are commonly more or less mixed with small stones and sand.

8. *The effects of the different modes of Reaping on the immediately*

succeeding Crops.—By whatever mode a grain crop may be reaped, I am quite convinced that the immediately succeeding crop will be more benefited by a long stubble than a short; and as longer stubble is left by the sickle than the scythe, the difference will be in favour of the former; but on no *grain* or *green* crop, on account of the mode by which the preceding crop had been reaped, have I detected a difference perceptible to the eye, nor discerned any cause of difference except the length of stubble left on the ground, which is greater by two and a-quarter inches by the sickle than by the scythe.

From the results of my own experience I have no hesitation in stating that, if the usual mode of mowing, viz., cutting close to the ground, be pursued in reaping a grain crop amongst which grass seeds have been sown, the grasses will not thrive so well as if the grain had been reaped by the sickle. But this is solely on account of the scythe cutting lower than the sickle, and is by no means an inevitable evil, as the expert mower will cut high or low as required, and it is easier to cut high than low, because the scythe keeps its edge longer; but mowers learn to cut low, for the purpose of obtaining as much straw as possible, and will indiscriminately cut all crops low if not otherwise directed. If a stubble, averaging four and a-half inches, be left, whether by the scythe or the sickle, the grain crop will, in reference to the prosperity of the young grasses, be a matter of no moment, except the ground be wet and soft, when more damage will be done by the reapers' feet by reaping than by mowing. It is assumed by some, that as the scythe, to work properly, requires to be very sharp, mowing is injurious to the young grasses by cutting off too much of their tops, which the sickle, especially the serrated sickle, slips over; but, as far as I am aware, this cropping does no harm; and it is generally allowed that it is not hurtful to crop young grass moderately by sheep when very luxuriant in autumn, and the ground is in such a state of consolidation as to sustain no injury from their feet. All that is required, to render mowing as conducive to the prosperity of young grasses as reaping, is the simple precaution of cutting a little higher than might be done if the ground is to be ploughed for the succeeding crop; and especially in late harvests, because the grass makes little or no progress after the grain is reaped. But, as far as my observation has extended, this precaution *is not taken* except in a very few cases. On the contrary, the grain crop among which grass seeds are sown, being uniformly that which immediately succeeds turnips, potatoes, or summer fallow, is cut closer to the ground than any other; because the soil, at seed time, being in a finely pulverized state, its surface is made smooth by the roller, and, if not disturbed before harvest, the crop is cut so close by the scythe

that a stubble little more than an inch in length is left; hence mowing is said to be injurious to young grass, and no wonder that it should.

Sir Humphry Davy says, "when perennial grasses are cropped very close, by feeding cattle in autumn, it is uniformly observed that they never rise so vigorously in spring, owing to the removal of that part of the stalk which would have afforded the grasses the sap for their first nourishment." A similar effect is produced by close mowing, whether by the same cause, or from want of the partial shelter afforded by the stubble, but probably partly from both causes.

9. *The Wages of Reapers.*—The farm on which I was superintendent, the three years preceding this, is situated in one of the inland districts of Aberdeenshire, at an elevation of about 300 feet above the level of the sea, and is partly sheltered by woods. On this farm, as on others, the time of commencing harvest varies with the seasons, but is usually on the last week of August or first week of September. The time of finishing also depends on the state of the weather, but we calculate upon accomplishing the whole work in twenty-six full work-days; however, as a harvest never passes without "broken days," five weeks and two days is its average duration. It is usually finished on the first or second week of October. On this farm the average extent of land under grain crop is 150 acres, the whole of which I have reaped with the scythe. The sickle has been little used in this and the adjoining districts for upwards of twenty years. The number of reapers employed was seventeen. The work was carried on thus:—Five men mowed, five women gathered, five men bound and stooked, and two lads raked. In this part of the country, reapers are not hired by the week nor the day, as in the south and west of Scotland, but are engaged, for a stated sum, to come forward when harvest is ready, and remain until it is finished. The conditions are, that, should an interval occur in harvesting, on account of wet weather, or part of the crop not be ready, they are entitled to victuals and lodgings, if they remain and make themselves useful on the farm, but have no claim to additional wages. They are engaged to assist in the entire work of harvesting, viz., reaping, carrying, thatching the stacks, and lifting the potatoes, of which only a very few acres are grown—and for these services the average rate of wages paid for the three years preceding this has been as follows:—

	£	s.	d.
To a man for mowing, stacking, &c.	2	12	6
To a woman for gathering, &c.	1	18	0
To a man for binding, &c.	2	2	0
To a lad for raking, &c.	1	8	0

As has already been remarked, we calculate upon performing the whole work of harvest in twenty-six days, and we consider the money-wages paid exclusively for the work done in those days, reckoning victuals and lodging equivalent to all the labour performed by harvesters the rest of the time they remain on the farm. The average expense of victuals, beer, and lodgings, is 4s. 6d. per week for each, or 9d. per work-day. The above rates of wages, divided by twenty-six, and in every case 9d. added—the value of victuals, &c.—the expense of a day's work of a band of seventeen reapers stands thus:—

		s.	d.		s.	d.
Five mowers,	each	2	9¼	=	13	10¼
Five gatherers,	...	2	2½	=	11	0½
Five binders,	...	2	4½	=	11	10½
Two rakers,	...	1	10	=	3	8
A day's wear of tools,					1	3
Total expense of one day's work,					£2 1	8¼

The average extent of a day's reaping was ten acres, one rood, and ten poles, therefore the expense of reaping was only 4s. ½d. per acre. The contractors who reap by the scythe in the south of Scotland, get 8s. per acre, in most instances; but as they are at the expense of taking the work-people a distance of 150 miles, and of bringing them back again, and are liable to loss of time in bad weather, they find this price little enough.

10. *Scythes and Sickles.*—The scythe-blade in greatest estimation for reaping grain, manufactured by Dyson & Co., Abbeydall, is 3 $\frac{1}{0}$ inches broad, and has an edge forty-two inches in length, and weighs 2¾ lbs. The piece of iron rivetted along the back of the blade has a bent extremity termed the heel; the sneath is fixed to this by a ferrule and wedge, and is known as the Aberdeenshire short sneath, of which there are various forms; but that most approved is of two pieces of ash, of unequal length, and quite straight, except the longer one, which has a slight bend *upwards*, near the heel. The longer, to which the blade and left handle are fixed, is forty-four inches in length; the shorter, to which the right handle is fixed, is eighteen inches in length, and joins the other at the distance of twenty-seven inches from the left handle, and at an angle of forty-five degrees. The general form of the short sneath is so well known that I deem a drawing of it unnecessary. I saw bundles of them exposed for sale in Edinburgh, and there were upwards of fifty mowers from Aberdeenshire at work with them in Berwickshire last year; but, as much depends on the form in which the blade and sneath are put together, I may state the following rules, which are strictly observed here, viz.:—To make the heel, the point, and the left handle, form the three extreme points of an equilateral triangle. Thus, the blade, includ-

ing the heel, is forty-four inches in length, and from the heel to the left handle is forty-four nches; therefore, from the left handle to the point of the blade should also be forty-four inches. Again, when the sneath is laid flat upon a level floor, with its handles upwards, if the scythe be in a right position, the point of the blade should be twenty-one inches from the floor. The heel of the blade, as it comes from the shop, has rarely the requisite bend for the short sneath, and requires to be adjusted by a blacksmith. The scythe, altogether, weighs $7\frac{1}{2}$ lbs., and is used without cradle or bow, and lays the grain as evenly in the swathe as can be desired. We pay 3s. 6d. for a blade, and 2s. 6d. for a sneath, and reckon a day's wear of scythe and sharping-stone $2\frac{1}{2}$d.

The smooth sickle used is a strong one, manufactured by T. Staniforth, and is well known. The blade is about $1\frac{1}{5}$ inches in breadth, and has a cutting edge 20 inches in length. The handle is of beech or plane-tree, about 6 inches in length by $4\frac{1}{2}$ inches in circumference. Reapers nail a leathern strap to the handle, by which it can be more firmly held in the hand. This sickle weighs 1 lb., and costs 1s. 2d., and a day's wear of it is reckoned $\frac{1}{2}$d.

The serrated sickle used is that made by Glegg, Stonehaven. The edge of it is $16\frac{1}{2}$ inches in length, and serrated to the depth of one-twenty-fifth of an inch; the serratures, about 300 in number, all pointed backward, or *towards* the handle, which is much of the same form as that of the smooth sickle. The serrated sickle weighs about 9 oz., and costs 1s. It is calculated to last, at least, four harvests, and its wear may, therefore, be reckoned under $\frac{1}{4}$d. per day.

The smooth sickle, though liable to abuse, is a manifest improvement on the saw-edged or serrated sickle, inasmuch as more work can be accomplished by it with less exertion; but let the scythe be put into experienced hands, and it will be found less tedious, less expensive, and more efficient than either kind of sickle. To those who have seen grain reaped by the scythe by expert hands, its advantages over reaping seem so great and obvious, that between the two modes they think it ludicrous to draw a parallel. On the other hand, those who have seen grain reaped by the scythe by *inexperienced* hands only are very sceptical as to its merits, and a good many have tried it, and given it up as a bad job. It is worthy of remark that the contractors, who go from this place to reap with the scythe to the south country, rarely make so good work as they usually do at home. The reasons are, *first*, it is not the best hands who go with them; and, *secondly*, they are somewhat careless, because many of those to whom they reap are not aware that they might do it better.

The practice of mowing grain is slowly gaining ground, and will in all probability continue to do so until it be universally adopted. In this part of the country reaping by the scythe has been general for upwards of twenty years; and numerous are the individuals of my acquaintance who have had twenty harvests reaped by the sickle before the scythe was introduced, and who are now as clearly convinced that mowing is an improvement in reaping, as of the modern two-horse being an improvement on the twelve-oxen plough of their fathers.

ON OIL AND TALLOW AS A SALVE FOR SHEEP.

By Mr Joseph Stewart, Leslie, Fifeshire.

During the early part of my life, and whilst I was shepherd on the farm of Snodown, situated on the highest lands in Lammermuir, I found the salve used there to be composed of 42 lbs. of butter to 8 pints of tar, for 100 sheep or hoggs. Afterwards, when I went to Tweedside, and was resident on the farm of Blackhaugh, on Caddon Water, I found the salve used there to be composed of 20 lbs. of butter to 10 pints of tar, for 60 sheep. This made the salve so thick and tough, that it had to be mixed with water, and beat up with a stick, before it could be applied to the sheep. I found that it neither kept the sheep so well as the Lammermuir salve, nor could so high a price be got for the wool.

My experience has led me to observe that tar or turpentine, either by itself or mixed with tobacco juice or arsenic, are all injurious to sheep and to wool, although not in the same degree.

Tar I consider as the least injurious; but even it I have had to apply, when it hurt my hands so much, that it was with difficulty I could continue the operation—and I have also seen it strip the wool clean from the sheep.

Turpentine, either with or without tobacco juice, I have always found injurious, except for the "scab." I have very often seen sheep killed outright with the application; others tumble over and sprawl on the ground, and unless immediately relieved by bleeding, would very soon have perished also.

Arsenic I consider by far the worst of the three, and *perfectly inadmissible, in any shape whatever, into sheep salve.* I have known sheep, after being smeared with a salve of which arsenic formed a portion, remain in a dull and unthriving state all winter; and, when such a salve was persevered in for three years on end, the sheep so treated almost invariably *lost their teeth.*

Having thus shortly stated my objections to the salves presently in use, which objections are all founded on actual experience, I shall proceed to give the results of my experience with another salve, which I have used with the greatest success for five years, producing high health amongst the sheep, along with a superior quality of wool, and this I consider as the *natural result* of a healthy state of the animal.

Having left the south country, I came to Fife, and got employment on the farm of Ballo, on the Lomond Hills. At that place, power was given me to manage the sheep entirely after my own fashion, and after much thought on the subject, and seeing so much harm done by the usual salves, I set myself to consider what were the real objects to be gained by salving. I considered they were two-fold; *first*, the destruction of vermin, and, *second*, the growth of wool of superior quality. Now it is clear that the more innocent the substances used, so much the better will it be for the sheep as well as the wool; for, in looking at the composition of the usual salves, it is easy to see that the tar, the turpentine, the juice of tobacco, and arsenic, are all merely calculated to kill vermin, and cannot possibly be beneficial to *wool*, but rather detrimental; while the absorption of a portion of any of them through the pores of the skin cannot fail to hurt the animal more or less, according to the quantity absorbed. Butter, therefore, appeared to be the only article that could benefit the wool, and at the same time not hurt the sheep. I then considered that possibly oil of the cheapest sort, and used by itself, would serve the intended purposes; but as oil runs off too easily by the heat of the sun, or even by that of the sheep themselves, it occurred to me to mix it with a portion of *tallow* which, while it is very nearly of the same nature, would tend to harden the salve, so as to retain it, and I wished to prove this by experiment. I felt assured that I would get superior wool, and I hoped and trusted that it would also prevent vermin on the sheep; but feeling some doubt on the propriety of leaving the tar entirely out, I mixed a portion amongst the oil and tallow in my first experiment. I mixed *equal portions* of *tallow* and *train oil*, weighing together 42 pounds, with 8 pints (16 quarts) of *tar*, for 100 hoggs. I then smeared 400 with that sort of salve, and it proved much better in its results than anything I had ever seen before, both for quantity and quality of wool, and the vermin were also kept away. The wool stapler said he had never had a clip come through his hands equal to it. Encouraged by this success, I next year left out the tar entirely, and smeared 400 hoggs with tallow and oil alone, in the proportions given above; and I found that I had a still larger growth of wool, and of superior quality, so much so, that it

realized in the market some shillings per stone more than any wool cured by salves containing tar—at the same time the advantage to the sheep was most decidedly apparent.

From these results I have no hesitation in saying that oil and tallow form the best salve for sheep of any that has hitherto been tried; and that, if the sheep-farmers of Scotland would use that salve alone, they would find their advantage in obtaining, 1*st*, about *a third* more money for their wool, on account of its superior quality and purity; and, 2*d*, an improved condition of their sheep. But as long custom renders people unwilling to leave off old habits, it will be difficult to convince them of the propriety of the change, and particularly as to refraining from the use of *tar*, which was long the *only* substance used. For this reason I would recommend farmers to try the oil and tallow mixed with a portion of tar, to begin with, and afterwards to dispense with it by gradual decrease; or to try the oil and tallow *on a few sheep only*, and compare these carefully with other sheep under the usual treatment, and I have no fear of the result being entirely in favour of the oil and tallow, both in regard to satisfaction as well as profit.

I have only to add, from what I have seen, that many shepherds are very unskilful in the operation of smearing, which, unless it is well performed, cannot be expected to produce its desired ends. Those who are in the habit of what is called *slyping*, in the south of Scotland, are not competent persons for applying the oil and tallow salve, unless they are also acquainted with the method called *rolling*.

ACCOUNT OF EXPERIMENTS ON IRRIGATION ON A LIMITED SCALE.

By Mr John Wilson, Eastfield, Penicuik, Mid-Lothian.

The first field experimented upon in irrigation contains about one and a-half acre imperial measure, which was lying a few years ago in a state little better than useless. From its proximity to the farm-steading, it had for many years been used as a park for the calves, which were reared upon the farm for a few weeks, until they were weaned and put to other pasture. But, as a proof of its great sterility, when we entered to the farm at Whitsunday 1839, we put two calves into it in the month of June, and were obliged to take them out two or three weeks afterwards, as it did not grow as much grass as to support them. Its herbage was of the coarsest description, and although in a shel-

tered situation, much of the ground was unswarded, and stunted heather was beginning to shew itself upon some of the driest parts, while a few straggling rushes wore a sickly appearance upon those parts which were saturated with wet.

In January 1840, we turned it over with the plough, and found the soil to be much inclined to moss, especially in the lower part of the park. It appeared as if it had been burned at some former period, as the soil was partly mixed with ashes. In the lower part of the park the subsoil is a stiff gravelly clay, while across the middle it becomes hard and stony, and is only covered with a few inches of surface; from this part a large quantity of mineral water flowed, and left a brown ochry sediment on the surface; nearer the top the soil is a dark-coloured earth about six inches deep, and the subsoil a fine clay. We sowed it with oats in the spring, and, excepting a small space at the upper end of the park, it was a very poor crop. We furrow-drained it in autumn, and planted it with potatoes in the spring following, with farm-yard manure at the rate of about 25 cubic yards per acre; the crop was middling good, being about 28 bolls, or 7 tons per acre. We then ploughed it into ridges about 18 feet broad, to answer the declivity. In the following spring we spread upon it the small quantity of about 10 bolls, or 60 bushels, of lime shells, per acre, and harrowed them in with the oats and grass seeds. Perennial rye-grass of excellent quality, which had been cut after the nineteenth year, and a few pounds of red and white clover, were the only seeds sown; the crop of oats was middling good, being about 7 bolls, or 42 bushels, per acre; but the sward of grass in autumn was far from luxuriant.

We applied the water to it in the month of November, which was done in the following manner:—A small rill, which has its source from a few drains at a little distance, had trickled by the steading for a great length of time, without being used for any other purpose than to afford drink to cattle, for which purpose, at times, from the smallness of the run, it was scarcely sufficient. During wet weather, however, in the winter season, it sometimes swelled to a considerable size, and as it then brought the washings of the farm road along with it, from a distance of about 300 yards, we thought it might be turned to some useful purpose in irrigation. We were in the habit of collecting all the urine from the offices into a reservoir, and carting it to the fields; but there was at times a considerable loss of that valuable liquid from the dunghill, which, when fully saturated, ran over. If, therefore, we could by any means raise the water of the rill to a sufficient height to come in contact with the refuse liquid of the dunghill, and form a small reservoir, it would then in wet weather catch all the rich washings of the premises, and conduct them over

the park in irrigating rills. We managed to effect this, and we have not been disappointed.

When we got the water raised to a sufficient height, we formed a main conducting flooder along the head of the ridges, and made small feeders from it to conduct the water occasionally into each ridge.

As the supply of water was small, and to prevent waste, we laid the bottom of the feeders with clay, which we got puddled at the clay-mill in the vicinity. The water was generally not more than sufficient for one ridge at a time, so we commenced at one side of the field, and regularly watered it ridge by ridge. We usually allowed the water to flow only about two days over a ridge, when we turned it off into another. We spread it over the ridges by damming the cuts with pieces of slate or stone. When we got once over the field, we commenced again at the other side, and continued to do so during the winter.

That part of the park which lay at the greatest distance from the water was apt to have got a less supply than the rest; but, fortunately, a few drains emptied themselves into a ditch which ran along the side of the park, and of this we took advantage, by raising the water in it to a sufficient height, where it had ample declivity to run along a cut made across the ridges; and we found that, from the feeding qualities of this water, and partly from a little of the more fertilizing liquid soaking into it from the flooder above, that it had a most wonderful effect in promoting fertility. Indeed the effects of the irrigation were visible in a few days after this contrivance was applied. Whenever the weather was fresh during the winter, the grass assumed a green appearance, and nothing could exceed the luxuriance of its growth when the spring set in.

We allowed a few ewes and lambs to pasture on it the first two weeks of April, which kept it back a little, but commenced cutting the grass about the beginning of June, and cut and consumed it green by horses and cows for nearly two months. Before it was all cut it was much too ripe, and some beginning to rot at the roots; but as the cattle continued to relish it, and it was so conveniently placed, we were loath to make any of it into hay. We, however, measured and win a portion of it to ascertain its weight per acre, and found it to be 402 stones, of 22 ℔s. to the stone per imperial acre. This portion was cut about the middle of the field, and might be reckoned a fair average sample. It was cut July 26, and weighed August 16. The second crop was excellent, being exceedingly heavy where the first crop was earliest cut. We commenced cutting it the second time on the 20th of August, and we cut a beautiful third crop from a considerable part of it till the frost came on the 13th of

October, when its growth was completely checked, and we then allowed the cows to eat up the foggage. When cutting the second and third crops, the sward was so close, that the swathe might almost have beon rolled up like a fleece of wool. Thus we have reason to believe that, by the continued application of the water, small as its allowance is, the ground may still, in future years, increase in fertility, and, of course, prove a valuable acquisition to the farm. It is now worth as many pounds a-year as it was before worth shillings, and the means which have been used to improve it have not been expensive, and any future charge that may be incurred to maintain and increase its fertility, will cost nearly nothing, seeing that the application of no fertilizing ingredient is required but what heretofore ran to waste.

The second portion of irrigation consists of about three imperial roods, which lie in a steep acclivity on the banks of a river. It is too steep to be brought under cultivation by the plough, and, being a dry gravelly soil, the want of sufficient moisture in summer seldom failed to render it almost useless. Having two years ago furrow-drained the field immediately above it, we led the main drain in a direction where we could catch another small supply of water that came from the surrounding fields. This was nearly all that was required; we had merely to make a small cut as a flooder along the top of the bank, and another across about half way down, when we let a small supply of water into each, and the steep declivity rendered it an easy matter to spread it over the surface. We kept the water upon it throughout the whole winter, and during summer, until a week or two before, commencing to cut the grass. When the supply of water was very small, we let it run a few days in one flooder and then in the other; but we found that it did no damage when it was allowed to run continually upon the same part. The first year the irrigation was applied, being 1842, it had no great effect, and the grass which was cut from it was foul, and not highly relished by the cattle; but in autumn a beautiful sward appeared; and in the present year, 1843, nothing could exceed the luxuriance of its growth, the water being still applied in the same manner. The grasses were much finer in quality than in the preceding year, and the cattle devoured it greedily. We measured and win a part of it to ascertain the weight, and found it to be the extraordinary weight of 440 stones, of 22 lbs. to the stone, per imperial acre; the hay was cut on the 7th of August, and weighed on the 28th of the same month. Thus another small portion of land has been brought from comparative barrenness into a state of great fertility, by means both simple and cheap, as a very small amount of labour and attention have been required, and for which, certainly, we have been most amply repaid.

The above experiments, although limited in extent, shew what may be gained with a very small supply of water, but they likewise afford assured evidence of the great value of irrigation in Scotland, when a plentiful supply can be obtained.

ACCOUNT OF EXPERIMENTS WITH GUANO, BONES, AND SOME SPECIAL MANURES ON MOSS LAND.

By John Carstairs, Esq. of Springfield, near Penicuik, Mid-Lothian.

The experiments were conducted on a piece of flaw moss of the depth of twenty feet, drained fourteen feet apart with drains two feet deep, filled with *riddled gravel*, and the sand riddled out of the gravel was *spread on the surface* of the moss. The moss had never been in crop before. Between the 20th of May and 5th June (1843) I planted the moss with small whole Buff potatoes about the size of walnuts, with the spade, fully closer than in a garden, and lifted them in the end of October and beginning of November.

The *first* experiment was made with nothing but *sand*; the produce was at the rate of 8½ bolls, or 1 ton 17 cwt. per imperial acre, very small, and not marketable potatoes.

The *second* was with improved *bone-manure*, price 6s. per cwt., at an expense of £5 per acre; produce at the rate of 12 bolls and 62 lbs., or 2 tons 19 cwt. 2 qrs. and 6 lbs. per acre, not many of them marketable, being very small potatoes.

The *third* was with *ammoniacal salts*, price per cwt. 17s., at an expense of £5 sterling per acre; produce 12 bolls 62 lbs., or 2 tons 19 cwt. 6 lbs. per acre, not many of them marketable potatoes.

The *fourth* was with *prepared bones, ammoniacal salts, and foreign guano*, mixed at an expense of £5 sterling per acre; produce 17 bolls 3 firlots and 40 lbs., or 3 tons 14 cwt. 1 qr. 12 lbs. per acre, rather small potatoes than otherways.

The *fifth* was with *guano*, at an expense of £5 sterling per acre; produce 38½ bolls, or 7 tons 16 cwt. 12 lbs. per acre, very good sized potatoes.

The *sixth* was with *farm-yard dung*, at an expense of £10 sterling per acre; produce, 41 bolls 2 firlots, or 8 tons 8 cwt. per acre, very good sized potatoes.

The following experiments were made in a field rather inclining to moss, furrow-drained and planted with the plough, but rather late in the season for a good crop; the potatoes planted

were London Blues, on the 5th June, and lifted on 25th October :—

The *first* experiment was with *prepared bones*, at an expense of £3 sterling per acre ; produce 11 bolls 2 firlots, or 2 tons 6 cwt. per acre.

The *second* was with *prepared bones and ammoniacal salts*, mixed at an expense of £3 sterling per acre ; produce 14 bolls, or 2 tons 16 cwt. per acre.

The *third* was with *prepared bones and guano*, mixed at an expense of £3 sterling ; produce 15 bolls 2 firlots 2 pecks, or 3 tons 4 cwt. 56 lbs., per acre.

The *fourth* was with *guano*, at an expense of £3 sterling per acre ; produce 17 bolls 3 firlots, or 3 tons 11 cwt., per acre.

The *fifth* was with *farm-yard dung*, at an expense of £6 sterling per acre ; produce 21 bolls 2 firlots 2 pecks, or 4 tons 7 cwt. 29 lb. per acre.

The *sixth* was in the same field, planted with Buff potatoes, with *farm-yard dung*, ten days earlier ; produce 37 bolls 2 firlots, or 7 tons 12 cwt., per acre.

The *seventh* was in another field of strong clay, also furrow-drained. I had 27 *drills*, or about half an acre, planted with Don potatoes on the 27th May with *guano*, at the rate of £3 per acre. The produce of the half acre was 16 bolls, or 3 tons 4 cwt., per acre. My cotters had 34 drills in the same field planted with dung ; produce 12 bolls, or 2 tons 8 cwt. per acre where the seed failed in a great measure ; but there was no failure with those planted with *guano*.

The following experiments on 4 acres of turnips was on furrow-drained land, rather inclining to moss, at an expense each of £3 sterling per acre, except the *farm-yard dung*, which cost double that at least. Each lot was 300 yards in length along a drill ; and the quantity was weighed by a steelyard in the barn-yard by myself. The turnips were the Purple-Top Yellow, all sown on the 14th June, and lifted on the 12th and 13th December :—

	Tops.				Bulbs.				Gross Weight.			
	tons.	cwts.	qrs.	lbs.	tons.	cwts.	qrs.	lbs.	tons.	cwts.	qrs.	lbs.
1st, With Ammoniacal Salts, .	3	3	3	10	3	19	2	4	7	3	1	14
2d. With prepared Bones, . .	4	3	1	24	10	6	3	14	14	10	1	10
3d, With Guano, . . .	4	18	1	6	10	1	1	10	14	19	2	14
4th, With Ammoniacal Salts and Guano, . . .	6	0	3	16	12	0	2	14	18	1	2	2
5th, With Farm-yard Dung, .	5	3	0	19	17	3	3	0	22	6	3	19

Experiments in another field inclining to moss, consisting of 6 acres, furrow-drained, sown on the 22d and 23d June, and lifted on 13th December.

	Tops.				Bulbs.				Gross Weight.			
	tons.	cwts.	qrs.	lbs.	tons.	cwts.	qrs.	lbs.	tons.	cwts.	qrs.	lbs.
1*st*, Without any manure at all,	1	19	1	14	4	18	0	24	6	17	2	0
2*d*, With Gypsum,	2	4	0	22	5	3	0	14	7	7	1	8
3*d*, With Bone-dust,	3	18	2	8	8	6	3	24	12	5	2	4
4*th*, With British Guano from Glasgow, 8s. per cwt.	3	18	2	8	12	0	2	14	15	19	0	22
5*th*, With Foreign Guano,	4	13	1	6	13	5	0	2	17	18	1	26
6*th*, With Farm-yard Dung,	6	7	2	20	20	12	2	2	27	0	0	22

In a letter to the secretary, accompanying the above accounts of his experiments, Mr Carstairs states the following particulars regarding his property :—Springfield, in the parish of Penicuik, is situate 800 feet above the level of the sea. About thirty years ago 253 acres of moss let for sheep pasture at £10 ster-ing, or 9½d. per acre, yearly. Since he took it into his own hands, in a course of improvement, he has improved two-thirds of this moss; the remainder consisting of deep flaw moss. He began to furrow-drain the ploughable part of it at 18 feet asunder, and since then has put an intermediate drain at 9 feet apart in 27 acres; and 1 acre he has drained at 4½ feet apart. For the crop of potatoes on this acre he was offered £20 in 1843, but refused, considering the crop 50 bolls, or 10 tons, which was worth six times the price of the original cost of the land—and this was only the third crop since the land was in a state of nature. Mr Carstairs states that his improved moss yields him the first stooks, stacks, clover, and hay, in the parish. From the irrigated portion, he cut, in 1843, from 2,000 to 3,000 stones, of 22 lbs. each, of meadow-hay, and from other portions he had from 2,000 to 3,000 stones of clover-hay. He had from 70 to 80 stacks of corn, containing from 5 to 8 bolls—that is, from 30 to 50 bushels each. These stacks he considers small, but makes them so, because it is better to have a small stack to win quickly, than a large one to heat quickly. He raised from 500 to 600 bolls, or 120 tons of potatoes. He has 8 or 10 cattle, 10 horses, old and young; and when he purchased the property there was just one family of five persons living on it, and there are now from 40 to 50 persons, and every year he gives employment to many labourers besides.

Besides the produce of the field, he is also successful in raising orchard fruit. From a single tree, in 1842, he plucked 100 apples, some of which weighed 14½ ounces each, and which obtained the premium at the Show of the Penicuik Horticultural Society.

COMMUNICATION from ALEXANDER GARTHSHORE STIRLING, Esq. of Craigbarnet, Lennoxtown, in Glasgow, on the NATURALIZATION of the ALPACA into SCOTLAND.

There are thousands of acres of hill ground in Scotland, the pasture of which may be called a *coarse bent*, which is never eaten by either cows, horses, or sheep. I have a good many acres upon my own estate fit for nothing. I first tried draining, then burning, but succeeded with neither. Having both heard and read some accounts of the llama of Peru, and on considering the habits and food of these most interesting animals, as also calculating upon the high altitude they live in, it struck me that one of the species, viz., the alpaca, was the very animal suited to live upon, and thrive on, the pasture above described, and exactly what was required as a desideratum for our *worst bent*. From what I have seen and *now* know, there is not a doubt in my mind but that the alpaca is the creature calculated to enrich both the proprietor and the tenant in the Highland districts.

Having gone to Liverpool, I endeavoured to get one of the captains of the ships who trade to South America to bring a couple of these Peruvian sheep. Accordingly, a venture was undertaken, and I promised to give £40 or guineas for a male and female. The captain succeeded in bringing three home, but they turned out to be *all females*. Of course they did not suit. However, a friend procured a pair for me, from the Earl of Derby's stock, (price £40,) which I accepted of. They were forwarded by one of the Liverpool steamers to the Broomielaw at Glasgow, and arrived at Craigbarnet quite safe from thence. They were conveyed out hither in a covered cart—distance twelve miles.

They were immediately put into the sheep-park amongst the other sheep, which at first were astonished, and stared to see such queer quadrupeds; but, after a few days, finding no molestation from the new-comers, they all became friends, and fed quite comfortably together; but the amusing part of it was my shooting pony—commander-in-chief of the park—who became perfectly wild and electrified, when he first saw them, galloping, snorting, kicking up his heels. The alpacas, however, never fled from him, but *advanced*. At length *he* became frightened at *them*, probably supposing the blackamoors to be "no cannie." However, in the course of eight or ten days, nothing but harmony prevailed amongst all parties.

The alpacas arrived the latter end of August. When the weather became cold, and the nights were getting long, a wooden shed was erected for them in the park. At first they hardly ever went into it; but when winter commenced, I made the

keeper (whom they follow like a dog) put up a small rack in their shed, in which was placed some rye-grass hay. The weather was fine, and they ate very little of it; but by and by, as winter advanced, they relished it better. I then ordered them to get a few yellow turnips, which at first they seemed to like, but, tiring of them, I desired a little corn to be given, which they partook of pretty freely; but one day the keeper told me they would not eat their corn, especially when the day was good. Having some excellent beans, I ordered the man to try them with a few. No sooner did the alpacas hear the beans rattling in the dish than they shewed an eager desire to have them, and, during several months, preferred them to every other sort of grain; indeed, so much so, that upon some oats being intermixed with the beans, the latter were picked out and the former neglected.

What is extremely satisfactory is the *hardiness* of these animals compared to our sheep, and their indefatigable perseverance in searching for food, when sheep would to a certainty starve. I may state that this winter, 1843–4, has proved a most severe one. The park in which the alpaca and sheep were confined, was covered for nearly three weeks with snow; and during that time there was not a vestige of herbage to be seen, with the exception of some little green tufts under the trees. The sheep required to be regularly fed with turnips and hay. Not so the alpacas; they were seen in the most stormy days under the trees for hours, constantly eating the grass, and never minding either the cold or snow. They have never had a day's illness, have never attempted to leap a fence, and are far easier to keep within an enclosure than the common sheep.

ON THE UTILITY OF PEAT-ASHES.

By the EARL OF STRATHMORE.

PEAT-ASHES cannot be said to have been totally overlooked or disregarded throughout England, though it is so very much in Scotland and Wales; and, indeed, they are only very partially used in England, where their manufacture is almost exclusively confined to Berkshire and Hampshire, and some few spots of Bedfordshire, but from whence it is carried by land for upwards of thirty miles, and sold at about 9d. per bushel. Indeed, so strong and powerful is the peat-ash that is burned in immense heaps at Woolhampton, near Newbury, that ten bushels

per acre are sufficient to apply, but the usual average elsewhere runs about thirty bushels per acre.

Considerable doubts have been expressed as to the quantity of peat-ashes to be used per acre on an average; but this cannot be exactly defined, as so very much must always depends upon two several points—*first*, the preparation of the ashes, and their sorts; and, *second*, the various soils, and their various natures, on which the ashes are to be used.

One general rule as to the method of preparing the ashes may suffice, as the best and most approved one, which is to have the peats cast in their proper season, and properly dried, and to be burnt in a kiln, properly covered in at the top, with a quick draught. This is the method of treating the "best cast peats," but the top, outsides, and the segdy and even foggy peats, may be burned in conical piles, and may still be brought into useful application, by making a freer use of them, as this mode of burning this class of peats will cost but very little, and the outside cover has only to be pared away to get at the under and best ashes. But taking the average run of peats, neither the best nor the worst, the quantity per acre, may fairly be stated, as an average, at from twenty to thirty bushels per acre, and for old upland meadow, or any old greensward, this quantity will produce as much or more Dutch honeysuckle and small herbage as either soot or ashes from sea-borne coal, at one-sixth of the cost, and, when mixed with lime or fine sand, will not only be a very superior top-dressing for all upland and other meadow, and red clover without rye-grass, but will also prove a most valuable compost and manure for carrots, parsnips, or mangel würzel, when used in stiff ground, with a strong and large dibbling stick, as is used in Leicestershire or Warwickshire, in all heavy grounds,* and for potatoes in common drills. The value of the

* This method of dibbling carrots, parsnips, and mangel würzel, with peat-compost in the heavy lands in Leicestershire and Warwickshire, have uniformly succeeded where every other culture and manure have failed, and is managed thus:—"Plough your land in the end of September or beginning of October with a good strong furrow, and in the month of March (about the middle) let your dibblers begin, always dibbling backwards, and making a hole about as wide as a pint bottle, and thirteen inches deep; fill up the hole with the peat-compost to within four inches of the top. Put into each hole eight or ten seeds, cover them over with the peat-compost till level with the ground, then draw a slight but strong "*bush harrow*" over them. When they have shot, let the three best shoots be left, and the rest weeded out carefully, as they may do to transplant and fill up any vacancies where the seed may have failed. This will be done by women and children better than by men. Let the remaining plants be earthed up, and this will be as good as one hoeing, and, on a second and final looking over the dibble-holes, let all the plants be removed but one, and earth that well up. In the very deep lands in Leicestershire, which will not bear a cart in the spring, donkeys are used with large panniers to carry the compost up and down each furrow, which answers very well, and does not poach the ground like horses and the lightest mounted carts.

peat-ashes in Warwickshire and Leicestershire is from 9d. to 1s. per bushel, and as climate, or too great a similarity of soil may be brought forward as an objection, the writer begs leave to say he has tried these ashes in the bleakest and least protected part of Aberdeenshire, with greater success than he ever did in Hertfordshire, Warwickshire, or Leicestershire, and he feels confident that these peat-ashes need only be generally tried to be as generally esteemed and used all over Scotland.

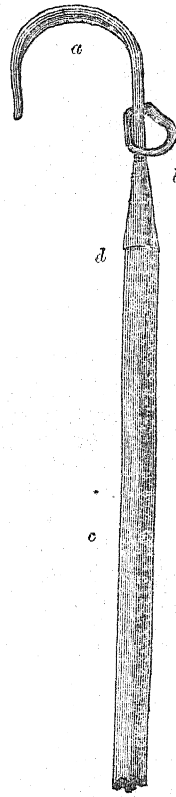
ON A SIMPLE MEANS OF SAFELY GUIDING THE FALL OF TREES WHEN BEING FELLED.

By John Borthwick, Esq., of Crookston.

In the thinning of plantations, or the cutting of trees in any situation, it is always an object of attention, and often of difficulty, to take care that they do not injure other trees, valuable shrubs, or fences, &c., in their fall. In cutting out a larch or fir, for instance, from some surrounding ashes, elms, or planes, if this consequence is not provided against, how often has one to regret the smashing of a fine hard-wood tree, or valuable shrubs or the breaking down of some expensive fence. To provide against such evils, means are taken to make the tree or trees that are cut fall in such a direction as to avoid them. If the trees are of any size, perhaps twenty or thirty years old, or even of less age and growth, it is generally found to be necessary to attach a rope or robes to the upper part of the tree, to be held and pulled by one or more persons, according to circumstances, so as to cause the tree, when cut, to fall in the proper direction. To accomplish this purpose, it has been customary to employ climbers, or persons to go up the tree by means of a ladder, to fix the ropes; an operation which is attended with much labour, loss of time, danger to the persons employed, and inefficiently, from the difficulty of knotting the rope sufficiently near the top of a tree, which is necessary in order to increase the lever or purchase upon it.

The inconvenience of these expedients led me to the discovery and adoption of the figured instrument in the accompanying cut, fig. 1.

FIG. 1.



It consists of the hook, *a*. The interior curve of the hook may vary in size from four to six or eight inches in diameter. The ring, *b*, must be of sufficient size to take in a rope of sufficient strength, say of what is called by the rope-makers from nine to eighteen threads. The handle or shaft, *c*, which must not be shorter than fifteen or eighteen feet, may be made of any light and strong wood, such as the shafts of hay-forks are made of. In my plantations I happened to have some tall overgrown mountain ashes, select ones of which I have employed for such handles. The hook is provided with a socket, *d*, into which the handle, *c*, is fitted, but is not *fastened* by any nail. This simple apparatus is carried by the forester's assistant easily in his arm. A proper place, such as the insertion of a branch, is chosen for placing the hook round on the tree to be cut. The rope, which is *spliced* through the ring of the hook, being unrolled, the shaft is inserted in the socket of the hook, and being held in the hand of the forester or his assistant, the hook is held up by it to the part of the tree selected as most proper to pull from; the hook is put round this part; the handle is then withdrawn from the socket; and, by means of the rope, the hook is pulled firmly into its place by the assistant, who takes his proper position so as to guide the tree, and he continues to pull as the forester advances in cutting the stem of the tree; and, whilst he aids the cutter by widening the opening of the cut, draws the tree over, in the direction wished for, where it gently falls and crashes down, without injury to anything.

Such is a short description of this instrument, and its use is attended with these advantages over the usual practice :—

1st, It saves much time, and consequently expense.

2dly, It obviates the risk and danger of accident which the use of the ladder is apt to occasion.

3dly, It may be used with great effect in the cutting of branches from large single trees. The object in cutting these, or pruning, as it is called, is to avoid stripping the bark, or making unseemly cuts. This, as every experienced woodsman

knows, is to be accomplished only by cutting the branch first about one-third through on the under side, and then completing the amputation from above. Now, from the weight of the branch, as the saw advances, when cutting on the under side, the cut closes and locks the saw. The apparatus described, in cases of this kind, is carried up by the assistant, it may be in this case by means of a ladder, into the body of the tree—for instance, a large oak, elm, or beech; he then applies his shaft, fixes the hook as near the extremity of the branch to be cut off as can be accomplished, removes the shaft, and pulls by the rope fixed to the ring in the hook, and thus lifts and keeps up the branch, so as to allow the saw freedom to make the *under* cut effectually. By this process, a smooth, and, to the tree, healthy lopping of the branch is effected, instead of the unsightly truncations which one occasionally sees where branches have been rudely cut from some fine old tree.

Having been led to the discovery of this method by the circumstance I have mentioned, and employed it for many years successfully here, and not having read of, or observed, any similar mode of conducting the process in question at other places, I ventured to describe it sometime ago verbally at one of the Society's meetings in the Museum.

DESCRIPTION OF AN INSTRUMENT FOR TOPPING, TAILING, AND LIFTING TURNIPS FROM THE GROUND PREPARATORY TO STORING.

By Mr James Kinninmonth, Farmer, Inverteil.

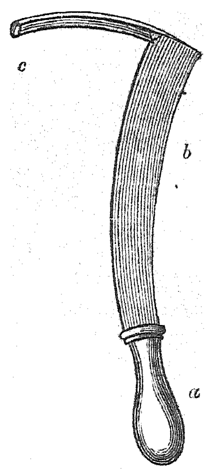
It is not necessary to enter here upon the many advantages that accrue to the farmer from the system of storing turnips for winter and early spring feeding, but it must always be considered expedient and beneficial that, in this, as in every other branch of useful industry, every improvement, whether of great or small moment, should be communicated for the general advantage.

The present communication originated from the inventor having long observed the injurious effects that followed the careless manner of conducting the lifting and trimming of turnips in the field, or that process called "topping and tailing." The instrument usually employed in this process, is the handle and part of the blade of an old reaping sickle. With that instrument in the right hand, the person employed seizes the turnip, yet connected with the ground, grasping the top with the left hand. If it lifts readily, so far well, but if it requires a considerable pull, the instrument in the right hand is then, in some parts of the coun-

try, applied to the bulb to assist in the operation. The cutting edge, of course, from the form of the instrument, must be applied to the bulb, and a deep gash is the consequence; this, when the root has been stored up for months, has generally the effect of destroying, in a great measure, its useful qualities, by producing premature decay in the adjacent parts, if not through the whole bulb.

To remove this source of deterioration to this highly important root has been the object of Mr Kinninmonth in producing this very simple and efficient instrument, "the turnip trimming knife," to public notice; and now, having such an implement, the farmer is careless of his own interest who allows his turnips to be injured in the process of lifting and trimming.

FIG. 2.



The annexed cut, fig. 2, is a representation of this knife, in which *a* is the handle, *b* the cutting edge of the instrument, steeled and properly tempered, and *c* is an appendage welded to the extremity of the back in the form of a narrow adze or hoe. The knife is held in the right hand as in the case of the old instrument; and if the turnip require any effort to draw it, the front of the hoe, *c*, is inserted gently *under* the bulb; and by applying it in this manner, not only is all risk of injury to the root avoided, but the operation of lifting is effected with greater ease and certainty. The turnip being now raised from the earth, and still grasped by the left hand, the knife is, by an easily acquired motion, turned half round in the right hand, and presents the cutting edge to the turnip, when, by a slight stroke, the tail or rootlet is first cut off, and then a second stroke severs the bulb from the tops, as is done in the usual way.

A considerable number of trimming knives of this construction, made under the direction of Mr Kinninmonth, have been in use during the two past seasons. The price at which they have been furnished is 1s. 6d. each; but there is every reason to believe that, were they brought out as a regular article of manufacture, the price might be considerably lower. For the information of those who may wish to make trial of these trimming knifes, we may add that James Slight & Co. of Edinburgh have hitherto been the chief makers, but the construction is so simple that they may be made by any blacksmith.

MEDALS OF THE HIGHLAND AND

FIG. 1.

The Gold & Silver Medal.

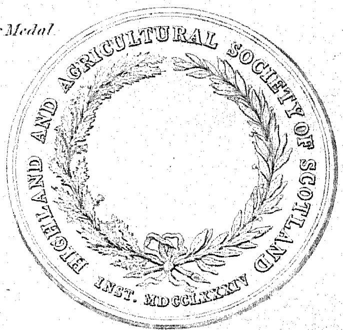
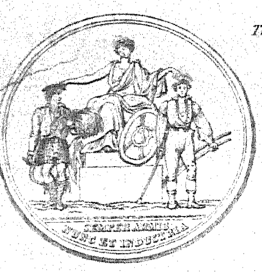


FIG. 2.

The Medium Gold Medal.



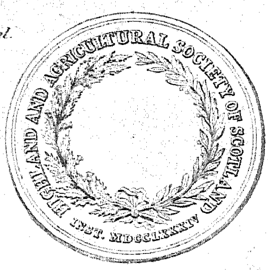
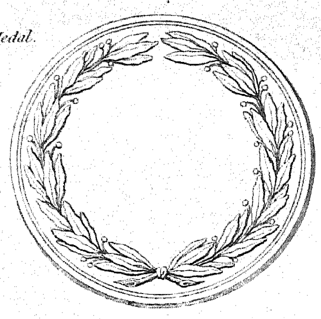


FIG. 3.

The Extra Gold Medal.



AGRICULTURAL SOCIETY OF SCOTLAND.

FIG. 4.

The Cottage Medal.

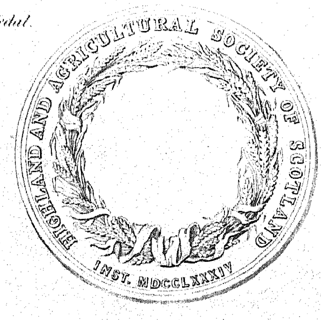


FIG. 5.

The Waste Land Medal.

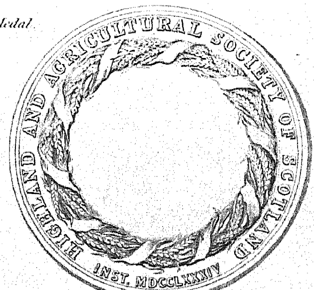
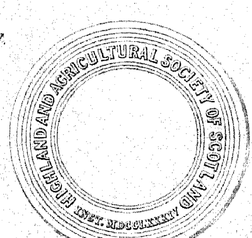


FIG. 6.

The Plough Medal.



Lizars sc.

NOTE DESCRIPTIVE OF THE MEDALS OF THE SOCIETY.

THE Society's "GOLD MEDAL" and the Society's "SILVER MEDAL," as represented in Fig. 1 of the annexed Plate, are both from the same die, cut by Mr Ingram of Birmingham, from a design by Mr Lizars of Edinburgh. These Medals are granted for approved Essays or Reports; for the improvement of old, or the invention of new, machinery; for successful competition in the rearing and fattening of stock, and for various other objects, as detailed in the annual List of Premiums.

The "MEDIUM GOLD MEDAL," from the same design, on a reduced scale—the die being cut by Mr Kirkwood of Edinburgh—is represented in Figure 2. It will be granted for successful contributions or competitions of the same nature, but, as its name imports, of less importance than those meriting the principal gold medal.

The "EXTRA GOLD MEDAL," Figure 3, is from a die cut by Messrs Sclater of Edinburgh, from a design by Mr Butters, and represents the heads of the three Sovereigns who have granted Charters or distinctive privileges to the Society. This Medal is intended to be granted on special occasions not included in the above enumeration.

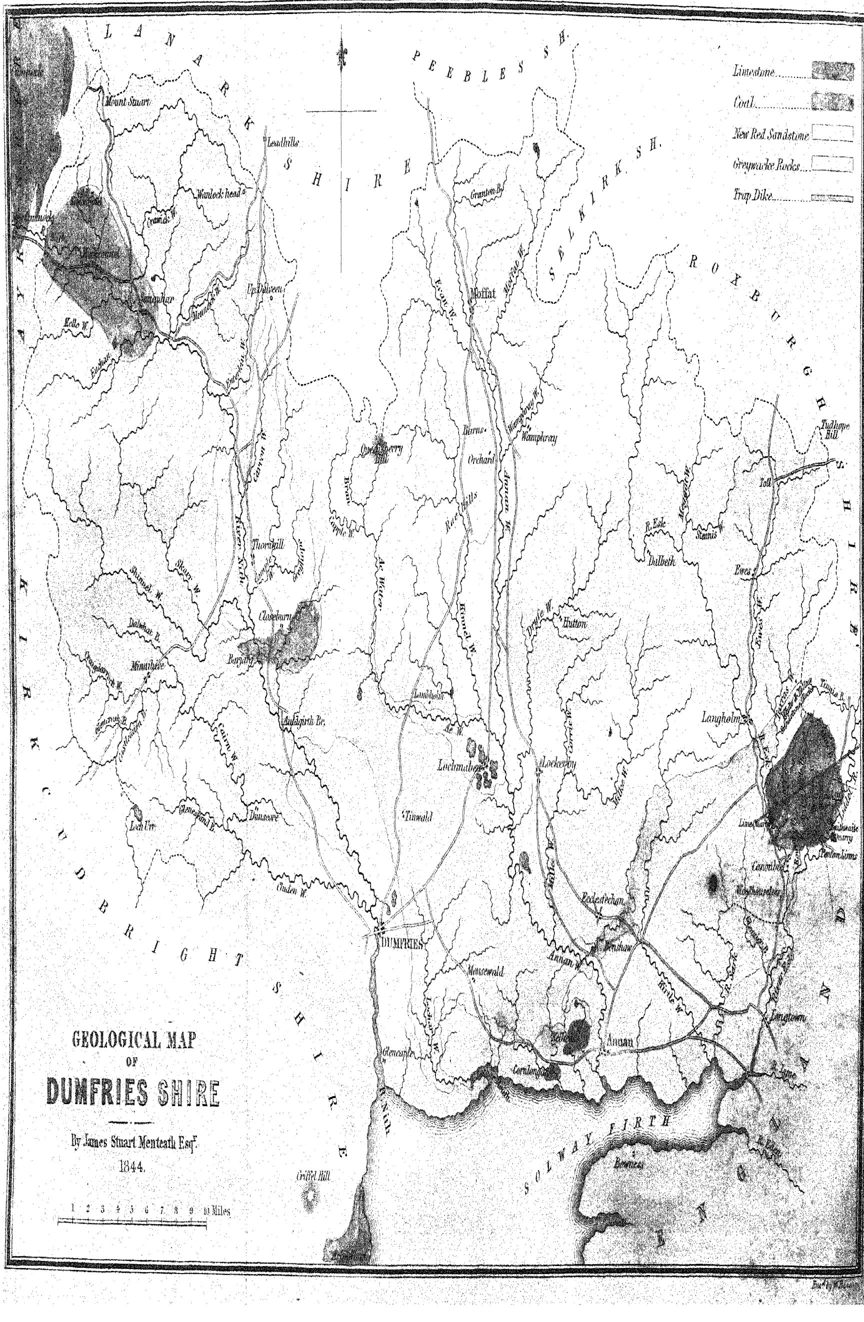
The "COTTAGE MEDAL," in silver, Figure 4, is granted for successful competition for the best kept Cottages and Cottage Gardens.

The "WASTE-LAND MEDAL," in silver, Figure 5, is granted for Improvements of Waste Lands on a small scale.

The "PLOUGH MEDAL," also in silver, Figure 6, is granted for successful competition at Ploughing Matches.

The dies for these last three medals have been cut by Mr Kirkwood, from designs by Mr Lizars.

All the medals are represented in obverse and reverse, and the diameters given in the Plates are those of the Medals themselves.


GEOLOGICAL MAP
OF
DUMFRIES SHIRE
By James Stuart Menteath Esqr.
1844.
1 2 3 4 5 6 7 8 9 10 Miles
Limestone
Coal
New Red Sandstone
Greywacke Rocks
Trap Dike
LANARKSHIRE
PEEBLES SH.
SELKIRK SH.
ROXBURGH SHIRE
KIRKCUDBRIGHT SHIRE
SOLWAY FIRTH
Mount Stuart
Leadhills
Wanlock head
Sanquhar
Up. Dalveen
Moffat
Granton B.
Evan W.
Moffat W.
Wamphray
Barns
Orchard
Queensberry Hill
Thornhill
Closeburn
Barjarg
Minnihive
Auldgirth Br.
Lochmaben
Lockerby
Hutton
Dalbeth
Ewes
Tudhope Hill
Toll
Langholm
Tinwald
Dunscore
Loch Urr
Cluden W.
DUMFRIES
Mouswald
Ecclefechan
Annan
Glencaple
Criffel Hill
Longtown
Bowness
Annan W.
Kirtle W.
Esk
Nith

GEOLOGY OF DUMFRIESSHIRE; with a Coloured GEOLOGICAL MAP of that County.

By JAMES STUART MENTEATH, Esq., Yr. of Closeburn Hall, Dumfriesshire.

[Premium—The Gold Medal.]

THE geology of Dumfriesshire, to the inquiring geologist, cannot fail to be interesting, as presenting to him a variety which few other counties of either England or Scotland furnish.

The county of Dumfries is traversed from N. to S. by three rivers, the Nith, Esk, and Annan. These rivers, in their course from the mountains whence they have their sources, pass through a country in which not only the hills, mountains, and valleys, but also the rocks and soils, exhibit much to interest the geologist and agriculturist. These rivers naturally divide the county into three large basins or districts, viz.—Nithsdale, Annandale, and Eskdale. Among these three basins are distributed the follow ing mineral deposits :—

1. Granite and Gneiss.
2. Greywacke.
3. Greywacke slate.
4. Basalt and Greenstone.
5. Amydaloid conglomerate and Pitch-stone.
6. Sandstones, { 1. New red. 2. White. 3. Grey. 4. Ochrey yellow.
7. Limestone.
8. Coal.
9. Lead.
10. Antimony.
11. Iron.
12. Blacklead or Graphite.
13. Gold.

On the western bank of the Nith, and near its mouth, is the *granite* formation, forming the Criffel range of hills. The *greywacke* forms hills of the most pleasing outline. Their sides sloping to the west are verdant, and, from the absorbent nature of the greywacke, their verdure seldom suffers from the hottest summer's sun, always yielding abundant pasturage to numerous flocks of sheep. The *slate* found in veins in the greywacke rock, though not of the best quality, is fitted for roofing houses. *Basalt* and *greenstone* are met with—the former in veins or dykes penetrating the coal formation of the basin of Sanquhar, as also that of the Esk; and it is also seen in a most interesting form —the columnar or Staffa-like shape of pillar—on the banks of the Cample, in the parish of Closeburn. The *sandstone* is of various kinds, and colours, and qualities. Some of it is of a perishable, decomposing nature, rendering it unfit for any kind of building; other sorts, again, are of a hard and compact texture, fitted to resist the action of the weather, and well adapted for all architectural purposes. The *coal* is of two sorts—the *splinty* and the

cubical. The latter is the purest and best for every use. *Lead* is found in several places of Nithsdale, and we believe in the higher parts of Eskdale; and there cannot be much doubt that wherever the greywacke rocks are of a close hard structure, by a little more search veins of lead might be discovered. *Antimony* is only met with in the upper mountain district of Eskdale. *Iron* has as yet been found in very inconsiderable quantities in Dumfriesshire. *Blacklead* or *graphite* is occasionally found in the basin of Sanquhar, and also in larger quantities in that of New Cumnock. These minerals, however, may be viewed to more advantage by considering the county of Dumfries as divided into three large basins, viz., Nithsdale, Annandale, and Eskdale; and, to become better acquainted with their mineral contents, we will pass with the reader through each in succession.

I. BASIN OF NITHSDALE.

The Nith rises in Ayrshire, and flows through the basin of Cumnock in that county into Dumfriesshire. In its progress through this county it flows through other three basins, viz., those of Sanquhar, Closeburn, and Dumfries, before it loses its waters in the Solway Frith.

As the Nith rises in the hills of Ayrshire, and flows through the basin of New Cumnock before it enters Dumfriesshire, it may be proper slightly to glance at the mineral contents of the basin of New Cumnock.

1. *Basin of New Cumnock.*—It is bounded on the W., N., and E., by greywacke, forming hills of no considerable elevation, far from pleasing in their outline. It is separated from the basin of Sanquhar by a ridge of greywacke, in which amygdaloid is found, nearly three miles broad. Its length is about ten miles and its breadth five miles. The coal formation fills all the central parts of the basin, and even spreads itself on the east over the sides of the greywacke hills. *Coal* is worked in several places. It occurs near the surface, in thick seams, from nine feet to twelve. The coal of the best quality is found at the great elevation of upwards of 1000 feet above the sea, at Mansfield, on the north side of Corsinscon Hill. The coal there is chiefly the cubical, and is raised in very large square blocks. At that elevated situation there are three principal beds, of nine, eleven, and twelve feet in thickness.

Imbedded in the twelve-feet seam of coal we meet with one of cannel coal, sixteen inches thick; and another bed of the same coal, twenty-two inches thick, has been found in another place, embedded in clay. Both these are free from sulphur. The gas at Dumfries, and other towns in that county and in Ayrshire, is chiefly prepared from this cannel coal. But the common cubical

coal, rich in bitumen, and being all devoid of sulphur, is often used, mixed with it, at the same town for the preparation of gas.

The coal is associated with *slate-clay*, *bituminous shale*, and *ochrey yellow sandstone*; and *ironstone in balls* is also found in some quantity, and beds of *common iron ore*, usually associated with coal. Fire-clay likewise accompanies the ironstone, of which good fire-bricks can be made.

The *carboniferous limestone*, which underlies the coal of the New Cumnock basin, is found in great quantities, and may be said to fringe the coal of this basin, and the beds of the argillaceous limestone interstratified with the coal strata.

On the banks of the Afton, a tributary of the Nith, *galena*, or *lead glance*, occurs in the greywacke rocks, but it is worked to no great extent; and *graphite*, or *blacklead*, is found at Craig man.

Fig. 1, Plate V. exhibits a Perpendicular Section of the Basin of New Cumnock.

No. 1. Represents the *soil*, containing various alluvial matters, as sand, gravel, rounded stones, &c.
2. *Yellow ochrey sandstone*—several beds of it.
3. *Coal*—various seams of coal, having between them beds of bituminous shale and clays.
4. *Yellowish sandstone*—in thick beds.
5. Carboniferous limestone.
6. Greywacke rocks, and several dykes of basalt.

The *soil* of the New Cumnock basin is clayey, stiff, and tenacious, suchlike as is found generally covering the coal formation. The herbage, though abundant, is coarse; but by better drainage, and by using great quantities of lime to top-dress the surface, it might be vastly improved, and made to feed a much greater number of sheep and cattle. The abundance of grass in this basin has naturally caused great attention to be bestowed upon dairy management. Extensive dairies abound, and a large quantity of cheese is yearly made and sent to the manufacturing districts. The breed of cows is highly esteemed, and great prices are often obtained for individual animals. There is much room for improvement in the cheese-making; and were the method of Cheshire followed in heating the milk, in preparing the rennet, in breaking down the curd, in pressing the cheese, and in rubbing it well externally with salt, and allowing it to stand two or three days in a strong brine solution in a tub, and abstaining from the use of all colouring matter whatever, a higher flavoured article might be produced, which would take the English market, and

yield a better price than Scotch cheese gives in England. The cheese of Ayrshire is equally rich with that of Cheshire, but it is not made with the same care, and attention, and cleanliness. It wants good flavour, and consequently fetches less money in that county. It is matter of serious consideration to improve the cheese, as large quantities are now imported from America of tolerable quality. The dairymaids ought to have premiums offered to them for making the best cheese by the agricultural societies of Ayrshire.

2. *Basin of Sanquhar.**—The river Nith, having worn for itself a passage through the greywacke ridge which divides the basin of New Cumnock from that of Sanquhar, enters that of the latter. In this ridge amygdaloid rock occurs. The hills encircling the basin are of greywacke rock. These hills are loftier and of more pleasing form than those of New Cumnock.

The coal formation occupies the central portions of this basin. The different beds of *coal*, accompanied with beds of sandstone, shales, and clays, seem to rest upon the greywacke rocks. The coal stretches along both sides of the Nith for about six or seven miles, scarcely exceeding two miles and a-half in width. Its position is very irregular. The strata are frequently broken, thrown down, and, as the collier expresses it, are "full of troubles." These beds of coal are crossed by two veins or dykes of basalt, which, in their course, alter the position of the strata. Near to these dykes the coal is charred, and of inferior quality. The coal of this basin has a splinty character, and not unfrequently contains pyrites. Of the twelve beds ascertained by borings in different parts of the basin the thinnest is only a few inches and the thickest does not exceed five feet. At the north west corner of this basin a smithy coal, used by blacksmiths, of a good quality, is found.

The boundary of this coal-field, according to Mr James M'Laren's survey of it, extends from Burnmouth up the Nith to the boundary of the county of Dumfries with that of Ayr. Its length is about seven and a-half miles, and the average breadth two and a-half. The figure somewhat resembles a ship's boat. The strata declines from each side to the river Nith.

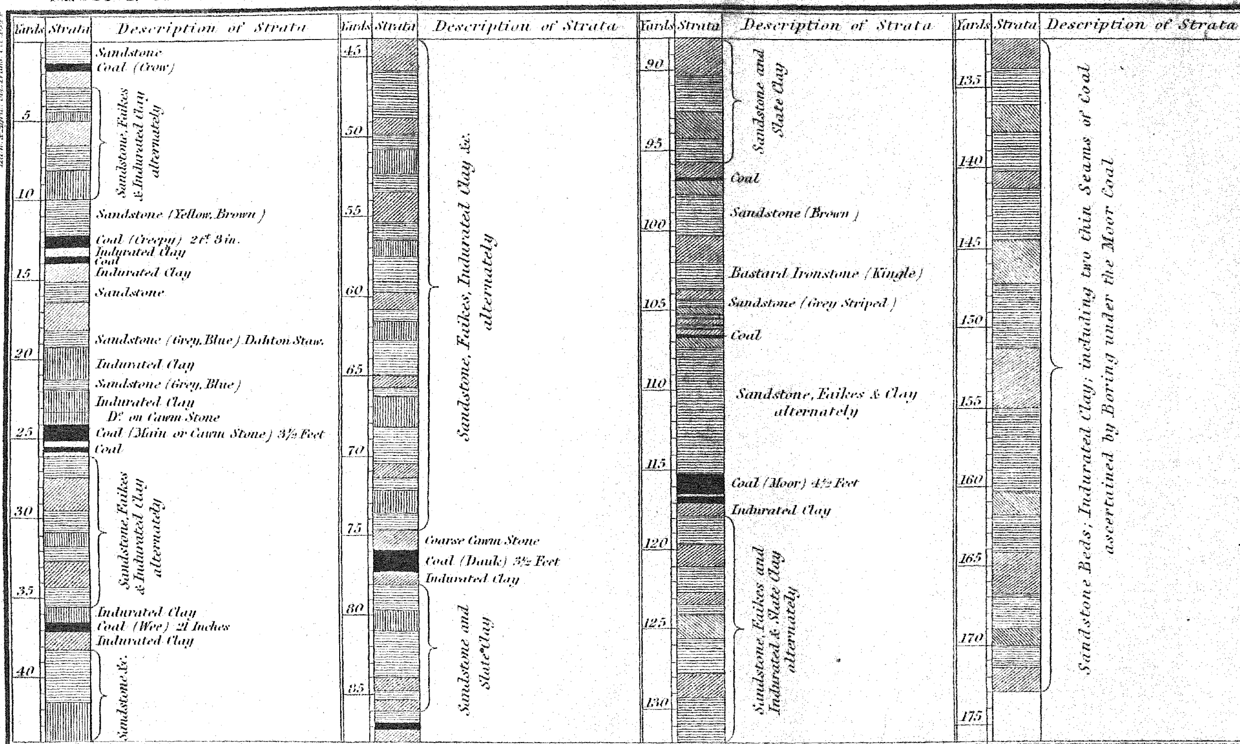
Plate VI. shews the different coals: their thickness and distance apart, with the accompanying strata of sandstone, &c.

* We are indebted to Mr James M'Laren, mineral engineer, for the *map* of the coal-field of the Sanquhar basin—for a *vertical section* across the basin, shewing the various dislocations the beds of coal have undergone from two basaltic dykes which penetrate this basin in different places; also to the same able mineral surveyor for a *list* of all the different strata, and their thickness, of this coal-field.

PLATE VI.

Hight. & Agric. Soc. Trans. Ocr. 1834.

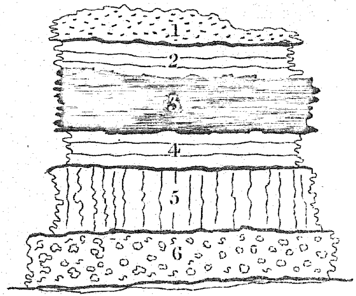
SECTION OF THE STRATA IN THE COAL-FIELD OF SANQUHAR AND KIRKCONNEL IN THE COUNTY OF DUMFRIES.



Engd. by W. H. Lizars

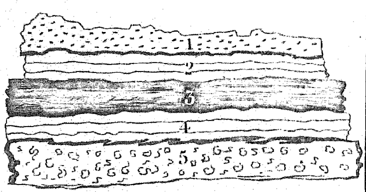
PLATE V.

Fig. 1.



SECTION OF THE BASIN OF NEW CUMNOCK.

Fig. 3.

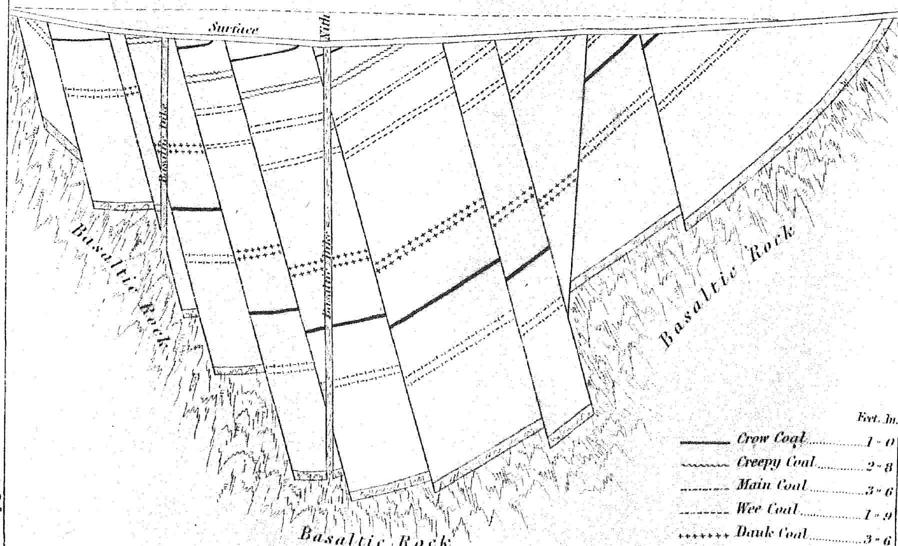


SECTION OF THE BASIN OF SANQUHAR.

VERTICAL SECTION OF SANQUHAR AND KIRKCONNEL COAL-FIELD,

from the Basaltic Rock one hundred Yards North of Holm-house, across the River Nith at the Manse of Sanquhar, and onwards in a straight line to where it is again bounded by the Basalt, in whole 4440 Yards.

Fig. 2.



The diagonal black Lines are Slips throwing the Strata upwards on one of its sides.

	Feet. In.
Crow Coal	1 " 0
Creepy Coal	2 " 8
Main Coal	3 " 6
Wee Coal	1 " 9
Dauk Coal	3 " 6
Ten Inch Coal	0 " 10
Moor Coal	4 " 6

Engd by W.H. Lizars

Fig. 2, Plate V. is a vertical section across this coal basin. The slips and dislocations depress or raise up the whole strata only a few inches in some places, in others many fathoms, so that one bed of coal is thrown up on one side of the slip to perhaps the horizontal bed of another on its other side. The different forms of lines in this section distinguish each bed of coal disturbed by slips or basaltic dykes.

There are five workable seams of coal, viz., the creepy, the main, the wee, the dauk, and the moor coal.

1*st Coal.* The uppermost of the workable coals is the *creepy*, which is usually about 2 feet 8 inches thick, with a stratum of brown sandstone for its roof.

2*d Coal* is termed the *main* coal, having a considerable thickness of fine calmstone for a roof. In this roof are imbedded two sorts of bluish-grey compact sandstone. This coal averages about 3½ feet in thickness.

3*d Coal* is called the *wee* coal. It is about 21 inches thick, having its roof composed of slate-clay and impure iron ore.

4*th Coal* is named the *dauk* coal. It is about 3½ feet thick, having a roof of coarse sandstone.

5*th Coal* is called the *moor* coal. It is about 4½ feet thick, having hard thin beds of white sandstone, with alternating ones of soft indurated clay for a roof. There is at the bottom of this coal a stratum of thin clay 2 inches thick, having vegetable impressions.

No *limestone* underlaying the coal of the Sanquhar basin has yet been discovered. The *ochrey yellow sandstone*, the usual attendant upon coal, occurs on both sides of the Nith. That found on the east side of the river is of a bad quality; but that which is met with on the west, as near the mouth of the Youchan, of a yellow-whitish colour, is an excellent building material.

Some traces of *ironstone* are observed near Crawick Bridge; and traces also at that place are observed of *blacklead*.

Lying to the eastward of the basin of Sanquhar, in the greywacke mountains, are the great lead mines of Wanlockhead and Leadhills. The principal ore at both places is *galena, a sulphuret of lead*, which is found in great quantities. From seven to nine ounces of silver can be extracted from the ton of lead.

The ores at Wanlockhead being particularly described by Professor Jameson in his Mineralogical Description of Dumfriesshire, we refer to it for an able account of the minerals found at that place. We also refer to a late account of this mineral district ably written by Dr Watson of Wanlockhead.*

* A Brief Historical Account of the Mines of Wanlockhead, by Dr Watson. Printed by M'Cormick and Carnie, Ayr.

It is interesting to observe that Wanlockhead, not more than two miles each way in extent, laying at the eastern edge of the basin of Sanquhar, where a hut would scarcely have been seen, but for the mineral treasures there deposited, has for more than a century supported an industrious and comfortable population. The miners at Leadhills have a library of 1200 volumes. Those of Wanlockhead another of 700. These volumes, in these wild alpine regions, we firmly believe, are more thoroughly read, and more anxiously sought after, by these industrious miners, than are the numerous and splendid volumes in many of the libraries in the low country: hence these people are comparatively well educated.

Gold is found by washing the sand of the streams in the vicinity of these mines. It is said that, in the reign of James V., as much as amounted to the sum of £100,000 was obtained in one year.

The rocks separating the basins of Sanquhar and Closeburn assume the appearance of *greywacke slate* more than any other part. The stratification is in many places nearly perpendicular, and runs from N.E. to S.W. At Burnmouth, a place about the middle of this ridge, which divides the basin of Sanquhar from that of Closeburn, it forms an indifferent slate. At Arkland, in the parish of Tynron, slates for roofing have been raised. Thus a slaty structure seems to extend from Glenochar, a slate quarry in Crawfordmuir, Lanarkshire, across the whole of Dumfriesshire in this direction; and probably it may be traced through Galloway, and ultimately across the north of Ireland.

Fig. 3, Plate V. is a Perpendicular Section of the Basin of Sanquhar.

No. 1. *Soil*, with various alluvial matters.
2. *Yellow ochrey sandstone*—different beds of it.
3. *Coal*—various seams of it, having beds of clays and bituminous shales, and sandstone between the different beds of coal.
4. *Yellow ochrey sandstones.*
5. *Greywacke rocks.*

3. *Basin of Closeburn.*—The Nith, after a rugged course of more than five miles, through a pent up rocky channel in the greywacke rocks, enters the basin of Closeburn, which is completely girdled round by greywacke hills. Of these the Lowther, whose highest elevation above the sea is about 3,300 feet, are the most pleasing. The interior of the basin of Closeburn is covered with rocks of the secondary formation. These are *sandstones* of different varieties

and *carboniferous limestone*. The most abundant rock is sandstone. Of it there are three varieties, the *New*, *Red*, *White*, and *Grey*. The *red* appears, in all its characters, to be the *new red sandstone* which overlays, in almost every part of our island, the rocks of the coal formation. It is by far the most abundant. It varies much in its texture, being sometimes hard, but oftener soft and friable. It covers over all the other strata of the basin, but is entirely confined to the east side of the Nith. One of the best examples of the appearance of its varied structure, and the irregularity of its dip, may be seen at Gately Bridge quarry, on the Cample, where this red sandstone exhibits its beds lying in all manner of directions, horizontal, upright, and variously inclined. In this quarry, roofing flags are raised and carried to a great distance. At Crichope Linn the finest section of new red sandstone, being 100 feet thick, is exhibited. It is there seen covering the other strata of the basin, which may be observed rising from underneath it. This red sandstone is marked occasionally with the feetmarks of the same reptile as are found at Craig's Quarry, Locher Brigs, and Corncockle red freestone quarries. In this romantic dell, the most unjustly and cruelly persecuted covenanters found a secure retreat from their implacable enemies. And the pen of the inimitable Sir Walter Scott has given this linn a classical interest, by having, in his tale of Old Mortality, made the Crichope Linn the hiding-place of the daring Balfour of Burleigh.

The *white and grey sandstones*, which underlie the new red sandstone, are not found in any considerable quantity. The best quarry for these two varieties is the *King's Quarry*, not far from Carron Bridge. They are both of compact texture. That which is found on the west bank of the Nith is the most durable stone. A very good section of these two varieties of sandstone is to be seen above Drumlanrig Bridge, on the east bank of the Nith.

The *carboniferous limestone* is found only at the south end of the basin of Closeburn, on both sides of the Nith, as at Closeburn and Barjarg, but at the latter in much less quantity. Organic remains only occur in the limestone at Closeburn. Among a few of the most interesting of these fossil shells, are *nautili*, some *spiral shells*, *producti*, *corals*, and *orthoceratites*. The *orthoceratites*, Professor Buckland states, in his Bridgewater Treatise, to be the largest known species anywhere to be found.

Not far from the Gately Bridge new red sandstone quarry, a mile above it, on the banks of the Cample, *basalt* in pentagonal columns occurs. It appears to form a narrow ridge or dyke, traceable from Mortonmainshill, on the N.E. of this spot, and it seems to take the direction of the Linburn Hill on the S.E.

Thin beds of *ironstone* in the greywacke are met in different places.

In this basin large *boulders of granite* are found in abundance, exceeding, in some instances, a ton in weight. The granite formation of Ayrshire, from which they appear to have been detached, is many miles distant.

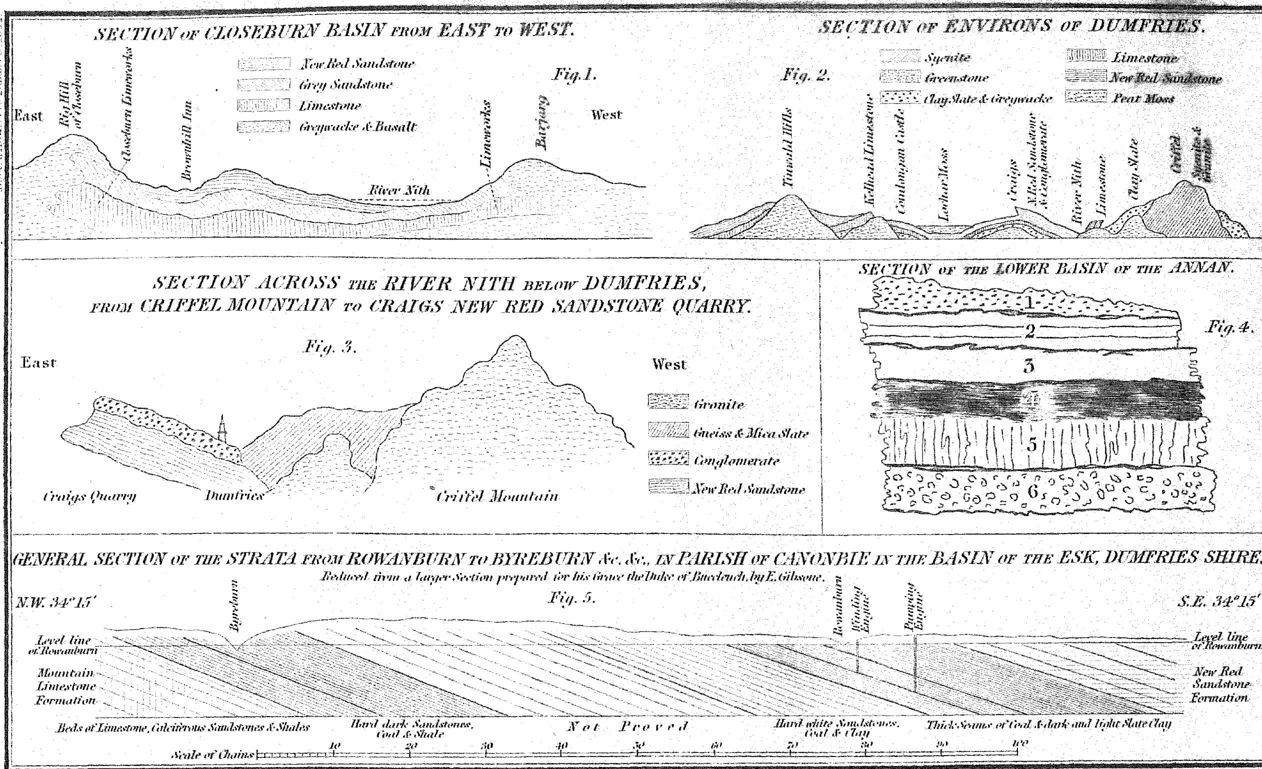
Though repeated attempts to discover coal, by boring in various situations in this basin, have been made, none have proved successful. We think, from the appearance of the strata, the absence of all bituminous shales, and of the ochrey and yellowish sandstone, that there is no coal formation in the basin of Closeburn, and that it is hopeless to expect to find it there. It appears to contain too thin a deposit of the secondary rocks, viz., the sandstone and the carboniferous limestone, (which, perhaps, altogether, may not exceed 250 feet,) covering the greywacke rocks, to admit of the coal formation being included between them. A section of this basin is shewn in Fig. 1, Plate VII.

Closeburn Limequarry.—It may not be improper to describe a little more minutely the limequarry of Closeburn, as it is the most extensive and centrical in the valley of the Nith. The quantity of limestone is very great, but intermixed with strata of various other kinds, all having their dip to the N.W. and their crop-out rising to the S.E. They appear to rise from underneath the new red sandstone, and to rest almost immediately on the greywacke. The beds of limestone are covered over by a great mass of earth, under which, in order, appear the following strata:—

No.		Feet.	Inches.
1.	Dogger, ...	2	0
2.	*Upper post of Limestone,*	14	0
3.	Dogger, ...	3	0
4.	Sandstone, (greyish,)	3	0
5.	Claybed, ...	3	0
6.	Sandstone, . . .	3	6
7.	Sandstone, . . .	1	6
8.	Fine Clay (for making fire-bricks,) . . .	2	6
9.	Claybed, ...	0	4
10.	Clay, ...	1	6
11.	Claybed, (fire-bricks made of it,)	3	0
12.	Limestone nodlings (*Lower post of Limestone with the* following beds,) .	2	0
13. 14.	Limestone (left for a roof by the miners,) .	3	6
15.	Limestone, . . .	2	0
16.	Forehead Limestone,	1	0
17.	Clay Marl, . . .	0	6
18.	Limestone, (pooling beds,)	0	6
19.	Clay Marl, . . .	0	6
20.	Limestone, (pooling beds,)	0	6
21.	Clay Marl, . . .	0	6
22.	Limestone, (pooling beds,)	0	6
23.	Limestone, (red beds,)	3	0
24.	Limestone, (lowest bed,)	2	0

The strata of the limeworks at Closeburn are divided by the workmen into *upper* and *lower posts*, and, in considering them, it may not be improper to retain these names.

The *upper post* of limestone is fourteen feet thick, being contained between two impure strata of limestone, called by the



Highl.d & Agricl. Soc. Trans. Vol. 1844.

Eng.d by W.H. Lizars

workmen Dogger. The *lower post* is about eighteen feet thick. The upper post, with strata of sandstone and clay, overlays the lower post. These two posts of sandstone seem, from appearances, not to extend from the present workings of Closeburn across the southern end of the bason of Closeburn to Barjarg on the west side of the Nith, as only the upper post is found at this last place. But the uniformity of their continued inclination is interrupted by a throw-down or dislocation of the strata. This is to be observed at the new kiln, situated to the south-west of the great workings.

In consequence of the great expense of removing the cover from the upper post of limestone, and likewise from a quantity of magnesia which it contains, little of this post is used. Magnesian limestone is thought to be too caustic for general agricultural purposes. The magnesia it contains is much longer than pure lime in reabsorbing from the air the carbonic acid; therefore its alkaline burning properties act too long and too powerfully on vegetation. The purer the lime the better for promoting grass and corn crops.

About forty years ago, specimens of this and of the lower post were analyzed by the late celebrated Dr Black of Edinburgh, but, from the imperfect method of analysis then known, the presence of magnesia was not detected in the upper post. But when this upper post was analyzed a few years ago, by the late ingenious Dr Murray, it was found to contain in 100 parts, 42 parts of carbonate of magnesia and 54 of carbonate of lime. When it is calcined it makes an excellent cement. Occasionally in this upper post cavities are observed, and are often found filled with the black oxide of manganese. In the limequarry of Barjarg the lower post of limestone, similar to that of Closeburn, is wanting. The Barjarg limerock, as that of the upper post of Closeburn, contains 42 parts of carbonate of magnesia.

The lower post is nearly eighteen feet below the upper, and separated from it by strata of sandstone and clay, having, however, the same dip as the upper. It is about eighteen feet thick, and is pure carbonate of lime, ascertained by Dr Murray's analysis to consist in the 100 parts of 91 of carbonate of lime, equivalent to 50 of pure lime. In this lower post are several small beds of clay or stone marl, with ten per cent. of carbonate of lime, and with impressions of shells intervening with Nos. 22 and 23, called the pooling beds of limestone, which have embedded in them some very interesting organic remains, which have been drawn and described by Sowerby in his Mineral Conchology. Advantage has been taken of these clay beds to mine the lower post of limestone. For some years the operations of this mining have been extensively carried on, and these excavations now

exceed many hundred square yards. In proceeding with these excavations, strong pillars, of nearly six square yards in thickness, are left standing, as supports for the roof of the mine, which is high enough to admit the miner to stand erect at his work, and between the pillars the space of thirty feet is excavated. This limestone, which is of a reddish colour, as is generally the case with all the limestones of Dumfriesshire, being extremely compact, requires the aid of gunpowder in working it. It is not improbable that this colour proceeds from the new red sandstone which seems at one time to have been the cover of all the secondary formations of the different basins of Dumfriesshire.

It is worthy of remark that the clay bed, No. 11, in which the water-channel is cut, is well adapted for making fire-bricks. The kilns at Closeburn works for burning lime are lined with the bricks made of this clay, and they resist without injury for a long time the great heat to which they are exposed.

The limequarry at Closeburn has been opened and worked above fifty years. The effects on the appearances of the country are most striking. When the present proprietor of Closeburn came into possession, the country around these lime works, to a considerable distance, was covered with heath, barren and unproductive.

By judiciously, however, applying lime as a top-dressing, the heath has gradually disappeared, and has been replaced by good herbage. The effects of this limequarry and of that of Barjarg may be seen all over the basin of Closeburn and in the adjoining basins of Sanquhar, Glencairn, and Dumfries, and even much further, as lime is conveyed to some parts of Galloway, distant forty miles from these works; for in neither of the districts of Galloway has lime hitherto been found.

Not far distant from Closeburn limeworks, on the same side of the Nith, are two small basins of limestone, which appear unconnected with it. That which is found at the Shielgreen is interesting, as it presents a vitrified appearance. It is not a pure limestone, but contains a portion of sand. The other occurs at the Linburn, and, though also very impure, differs from that of the Shielgreen.

The *soil* of the basin of Closeburn varies very much, partaking somewhat of the character of the strata which it covers. The soil nearest to the greywacke is clayey and tenacious, requiring much drainage and much lime. Its improvement after these operations is rapid. Much of the interior of the surface of the basin is thrown up into small risings or eminences, and the soil of all these is invariably of a water-worn rounded pebbly gravel. This kind of soil is congenial to the growth of root crops, and

yields the most luxuriant turnips. The numerous hollows intervening between these gravelly hillocks are frequently filled with peat-moss, of which the industrious husbandman has availed himself, in many instances, to make into compost with lime, and strew over these gravelly grounds; and by these means, and by cultivating the turnip, and feeding them off with sheep, he is enabled to reap heavy crops of grain as well as potatoes from these light gravelly tracts of this basin.

There is a narrow tract of soil, murish and filled with white round pebbly stones, and which is the very worst of all the soils in the basin of Closeburn—and this is with great difficulty rendered productive.

All the variety of soil, however, of the Closeburn basin are improved by lime; and whenever larger dozes of it are laid on the soil, and a better system of husbandry generally pursued, very great improvements may be expected in the general aspect of the whole surface of the district.

We may remark that the earliest and most fertile soil in this basin is that which rests on the new red sandstone. It is also curious to observe that, on the soil resting on this rock, the snow sooner melts than on the others. Perhaps it absorbs more heat, and hence the reason for its early character in ripening all crops growing upon it. The most fertile tracts and orchard districts in England are upon the red marl or new red sandstone.

It may be worth while, as connected with the subject of soil, to mention some curious facts respecting the growth, toughness, and durability of different kinds of *timber* in the basin of Closeburn, and which, no doubt, may be looked for in other districts of Scotland similarly circumstanced.

The *Scots fir* thrives well, but does not grow fast on the soil over the *sandstone*. Its wood, however, is tough and very durable. But when this same tree is planted on the *greywacke*, though it grows more rapidly, and arrives sooner at maturity, yet being softer and fuller of white wood than that grown upon the sandstone, the builder, to his cost, finds that it is soon attacked by the worm, and decays.

The reverse of this happens with the *larch* when growing on the *greywacke*. Its wood is sound and good, and when cut down is at heart quite perfect. But on the sandstones and gravels of this basin it seems to be at maturity at an earlier age than that growing on the greywacke; and in some few instances, when cut down on these soils, it presents a tubed decayed heart, whilst externally to the eye it seems healthy and vigorous.

We may here state that the larch grows naturally only on the igneous rocks, as the granite, gneiss, and the like rocks of that

class which compose the Alps of Switzerland. And it is most curious to observe that, on the whole range of the Jura Mountains, separating that country from France, and being a sandstone and limestone formation, rising to an elevation of several thousand feet, not a single self-sown indigenous larch can be discovered. Advancing, however, from this range into Switzerland, it may be observed that, in those places, as at Chamouni, Mount Cenis, the Simplon, and the lofty Alps, which partly enclose the beautiful lake of Thouin in the Canton of Berne, where the igneous formation, consisting of granite, gneiss, mica slate, and similar rocks abound, the *larch* is indigenous, growing luxuriantly, and attaining to a great size. Almost at the summit of the Simplon, upwards of 6,550 feet of elevation above the sea, about twenty years ago, a larch tree that had been snapped asunder by the storm was measured, and its remaining stump without the bark, at three feet from the ground, girthed sixteen feet. The durability of the larch throughout Switzerland is proverbial; and in all situations where exposure to weather must be encountered, such as roofing of houses and the like, recourse is always had to this wood. It is said that the piles on which Venice is built are of larch; and that her navy in the days of her prosperity were constructed chiefly of this wood. And the great painters of Italy, before the discovery of America, which introduced mahogany wood to their notice, employed larch panel for the immortal productions of their pencil. It would thus appear that the greywacke, partaking of the qualities of the igneous mountain soil, is the best qualified to grow the larch, and in Nithsdale the larch ought principally to be planted on the greywacke, as is evidently proved by experience in the basin of Closeburn.

As connected with wood, we cannot omit to state that the proprietor of Closeburn has for many years used a steep of lime water to preserve Scots fir and other wood, before working it up for building purposes. A pond of lime-water is near the saw-mill, into which the planks are plunged, and suffered to steep for a fortnight, or longer if the plank be thick. Experience of upwards of forty years verifies the value of this simple preparation of the wood previous to its being used. No worm or decay is observed in wood previously so prepared. We firmly believe that this lime-water steep for wood will be found better to preserve it than Kyan's steep, or any other. The wood in lime-water undergoes various changes. It neutralizes or destroys albuminous sap, which yields food to the worm, and which last vegetable principle, by its decay, produces the parasitic plant, which gives name to the *dry-rot*. The lime water, penetrating the interstices of the wood, partially petrifies it, and renders it

more hard, tough, and durable, and probably less inflammable—a security against fire.

While enumerating the mineral productions of this basin, we must not forget to mention its mineral springs, although these are neither numerous nor important. In some places *chalybeate waters* are found, and have been used to considerable advantage. Near the castle of Closeburn, issuing from a peat-moss, now improved, is a *sulphuretted hydrogen* spring, and another at no great distance, which are sometimes resorted to with good effect in cutaneous complaints.

4. *Basin of Dumfries.*—The basin of Dumfries, the last of those that form Nithsdale, is separated from that of Closeburn by a considerable ridge of greywacke nearly five miles in breadth. Through this ridge the Nith opens itself a passage, and enters the basin of Dumfries. This basin is open on the south, and is there bounded by the Solway Frith; but on the N.E. and W. is encircled by the greywacke rocks, except at the S.E., near Mousewald Kirk, where it unites itself to Annandale. The greywacke hills which partly surround the basin of Dumfries, on E., N., and W., are of lower elevation than those of Closeburn, and of much less pleasing forms. They are green, and cultivated to their summits, but produce fewer streams than the three preceding basins. Of these the only one of any size, falling into the Nith below Lincluden Abbey, is the Cluden. In its long, pleasing, and winding course, it passes through the parish of Glencairn, a pretty, wooded, sequestered basin. The whole of it, as well as its encircling mountains, are greywacke, separating it from New Cumnock, Sanquhar, and Closeburn. The Lochar, a detached and independent stream, in its way to join the Solway at Caerlaverock Castle, passes through an extensive peat-moss, which, by its broken, black, swampy appearance, casts a gloom on all the beautiful scenery of the lower part of the basin of Dumfries.

The interior of the basin of Dumfries is filled entirely with the *new red sandstone;* for as yet no traces of the *white* and *grey* have been discovered. This red sandstone is softer, and decays sooner by exposure to the weather, than that of the basin of Closeburn. In the new red sandstone at Craigs, about two miles east of Dumfries, similar impressions of the *land tortoise* as are observed at Corncockle Muir new red sandstone, in the upper basin of the Annan, are occasionally discovered. At Craigs, and in the direction of Caerlaverock Castle, the new red sandstone is overlaid by a thick bed of conglomerate rock, in which are masses of basalt and of other rocks, some of them exceeding the size of a man's head. On the west bank of the Nith, in Galloway, the granite formation occurs, and occupies a large tract of country.

To the south of Criffel, and between it and the sea, as at Arbigland, the *coal formation* shews itself. But the strata are so much on their edge, so irregular in their inclination, and so trifling in their thickness, that there is no workable bed of coal. The *carboniferous limestone*, full of shells and other organic remains, underlays this coal formation. It is not improbable, from this appearance of the coal stratification at Arbigland, that the Solway Frith is a great coal basin, for coal on the opposite side, as at Workington and Whitehaven, is worked to a very great extent, and for a considerable distance under the sea.

No *carboniferous limestone* has been discovered in the basin of Dumfries. A little beyond its S.E. extremity, as at Comlongan, the limestone appears, but coarse and bad in quality. The farther, however, we penetrate into Annandale, in its lower district, it becomes better and more abundant.

Of the ores no traces have hitherto been met with in the basin of Dumfries.

Fig. 2, Plate VII. exhibits the position of the strata in the immediate vicinity of the town of Dumfries.

Above the new red sandstone at Craig's Quarry, unconformable to its strata, rests a mass of *conglomerate*, consisting of a base of new red sandstone, with masses of trap rocks, sienite, greywacke, and slate imbedded, as seen in Fig. 3, Plate VII.*

Here, as in the valley of Closeburn, the greywacke decays into a *soil* which is a cold stiff clay, requiring time to loosen, pulverize, and fit it for the growth of herbage. Not much, however, of this kind of soil occurs in this basin; for the greater part of it, resting on the red sandstone, partakes of those qualities that are usually observed in red sandstone districts. The soil is generally warm, early, light, and gravelly, and, with manure and good husbandry, makes a good productive soil. On the western slope of the Tinwald greywacke hills, the soil is rich, deep, and loamy, and may perhaps be considered the best agricultural tract of soil in the basin of Dumfries, or in any of the other basins of this county.

It is a great hinderance to the more improved cultivation of the basin of Dumfries that no limestone has been found in it—all that is required for agricultural and building purposes being either imported from Cumberland or brought from Closeburn or Barjarg limeworks, or Kelhead, in Annandale.

Thus we have pointed out only a few of the most striking mineralogical appearances, including those of soil, in the four

* We are obliged to William Rhind, Esq., who is publishing the *Geology of Scotland*; for he has kindly allowed us to take from that work the two sections of the country near Dumfries.

basins of Nithsdale, and we have found that each has some peculiarity. The basin of New Cumnock, abounding in coal and limestone, though at a considerable elevation, and with a strong, cold, adhesive clay soil, is cultivated almost to the summits of the hills, and inhabited by an industrious, active population, who have availed themselves of their natural advantages, and have turned their attention and capital to collect large dairies, which yield them ample returns in butter and cheese. It cannot be doubted that these improvements have, in a great measure, resulted from, and been fostered by, the abundance and cheapness of lime in which this basin abounds; while, on the other hand, the Sanquhar basin, although it is lower, and consequently with a more favourable climate, and in possession of coal for all its necessities, yet being deprived of limestone, and obliged, at some expense, to import it from other quarters, has been retarded in its improvements.

But the basin of Closeburn, without a particle of coal, yet having within itself, at its southern extremity, as at Closeburn and Barjarg, limestone, has made rapid strides in improvement. Many and most striking evidences on the estate of Closeburn are before the eye, of the cheering alterations which lime, laid on in great quantities, makes on the face of a heathery and barren tract of country.

Even the basin of Dumfries, deprived of either coal or limestone, has, by good communications by land, and by improvements in its river navigation, been enabled to remedy in some degree its want of a limestone deposit, and not be outdone by the natural advantages of the three higher basins of the Nith.

It may not here be unworthy of remark, and may appear not a little extraordinary, that in situations so similar as the basins of New Cumnock, Sanquhar, and Closeburn, we find coal and lime in abundance in *one*, coal only in *another*, and lime alone in a *third*. What process could be going on in these different basins so as to afford this difference of products, geology has not yet, perhaps, advanced sufficiently far to enable us to attempt any satisfactory explanation.

II. BASIN OF ANNANDALE.

Having given a hasty account of the geological productions of the four basins of the Nith, it may not be uninteresting to take a rapid glance of the other two districts into which Dumfriesshire is naturally divided, Annandale and Eskdale.

1. *Upper Basin of the Annan.*—Annandale may be divided into the upper and lower basins.

The *upper* is separated from the lower basin by a narrow ridge of basaltic amygdaloid rocks, which runs across the river Annan at the manse of St Mungo, thereby uniting the Tinwald greywacke ridge of hills with those on the eastern bank of that river; and this rock may be traced skirting the greywacke mountains from Burnswark to Langholm. This rock seems to cut off the new red sandstone of the upper and lower basins of the Annan.

The *greywacke* mountains which shut in this upper basin of the Annan are lofty, and to the N. present a bold picturesque outline, but not so romanticly beautiful as the Lowther range of hills of the basin of Closeburn. Their slopes to the river Annan afford good pasturage to numerous flocks of sheep. On the west the Annan is joined by the streams of Evan, Ae, and Kinnel; on the east by those of Moffat, Wamphray, Dryfe, and Milke, all proving, by their number issuing from these mountains, their great elevation.

The central part of this upper basin of the Annan is nearly filled with the *new red sandstone.* Little of it is seen on the eastern bank of the Annan. This *red sandstone* is well fitted, from its compact texture, for all kinds of building. The *red sandstone* in the parish of Moffat extends from Corhead to Bellcraig. In this distance its surface is exposed by a number of burns. On the sides of these, where it is worn down to a considerable depth by the water, it sometimes presents the appearance of a uniform red sandstone, so soft as not to be useful for building; but more generally of a soft red sandstone, having a great number of common stones mixed in it.

At Corncockle Muir *new red sandstone quarry*, which is between the Annan and the Kinnel, the impressions of the *land tortoise* are observable upon different beds of this rock. Its strata are of a very unequal thickness. It lies in the direction of the greater part of new red sandstone of this basin, which is from W.N.W. to E.S.E., with its dip southerly, inclining at an angle of 38°. We have observed the same interesting occurrence at Craigs new red sandstone quarry, in the basin of Dumfries, and is occasionally met with in the new red sandstone of the basin of Closeburn. These fossil animal impressions seem peculiar to the new red sandstone formation. They occur in this formation of rock in Saxony, at Hessberg. We have not as yet found any *white* or *grey sandstone* any where in this upper basin of the Annan: neither *limestone* nor ores of any kind have hitherto been met with.

Gypsum is found in Frenchland Burn, near Moffat. It was employed for preparing the stucco of the ceilings of the Spur Inn at Moffat. Now that this mineral is so much recommended for agricultural purposes, it ought to induce the working of it.

A mile from Moffat is a *sulphuretted hydrogen spring*, issuing from a greywacke rock, containing iron pyrites, and passing through a peat-bog, where it is probably still more impregnated with sulphur. About five miles from Moffat is *Hartfell Spa*, which is a *strong chalybeate*. It issues from a rock of *alum slate* on the side of the mountain of Hartfell.

The mineral springs have caused great resort to this district, and have thus, as it were, created the interesting village of Moffat, and contributed to the improvement of the neighbouring country.

The soil of this upper basin of the Annan partly consists of a stiff tenacious clay, which may be probably owing to the number of streams constantly wearing away the greywacke mountains and carrying their earthy materials into the basin. The soil in some of the more level parts, as on the banks of the Annan, is a fine rich alluvial loam, productive of all kinds of grain.

2. *Lower Basin of the Annan.*—The lower basin of the Annan commences to the south of the manse of St Mungo, and expands itself a considerable way towards the Solway Frith: on the W. it unites itself to the basin of Dumfries, and on the E. to the lower basin of the Esk.

The sandstone which prevails is the *new red*, which appears to overlay all the other strata. At the Cove Quarry, on the banks of the Kirtle, the *light ochrey yellow-coloured sandstone* bursts up from underneath the new red sandstone. It is hereabouts, and upon the estate of Springkell, where this ochrey yellow sandstone abounds, that there is any prospect of finding coal. At Linbridge Ford, on the Kirtle, in the year 1795, in boring for coal at 140 feet in depth, a four-inch seam of this mineral was discovered. Though coal be found, we are very doubtful if there be beds of sufficient thickness to repay the expense of working it; and, from the late attempts that have been undertaken in this quarter, the prospects of finding a profitable bed of coal are very distant. *Clay ironstone* is interstratified near Ecclefechan with beds of reddish-brown slate-clay. The beds of ironstone are from three inches to a foot in thickness.

Carboniferous limestone abounds. At Kelhead, this rock is burned very extensively. Its thickness is about thirty feet. In various other places, as at Brownmuir, Blackrig, Cauldron Linns, Highmuir, on the eastern bank of the Annan, limestone of excellent quality is met with, and is burned for agricultural purposes. The Kelhead limestone, with the exception of the gigantic orthoceratites, contains all the shells that the limestone of Closeburn is noted to possess. The other limestone quarries of

Annandale are equally rich in the same organic remains. All these limestones are of a reddish colour, arising probably from the new red sandstone, which seems to have once covered over all the limestone of this basin. It has been believed by some that coal may be discovered between Kelhead limequarry and the sea; but from the appearances of the substances overlaying that limestone, and the little space for any great body of the coal formation to cover over it, we think the discovery very doubtful.

The section of the lower basin of the Annan is the same as that of the lower Esk; namely, as shewn in Fig. 4, Plate VII.

No. 1. *Soil* containing different alluvial matters.
2. *New red sandstone.*
3. A yellowish sandstone.
4. *Coal*—metals. We are told that, in boring upon the Springkell estate, a thin bed of coal was found.
5. *Carboniferous limestone.*
6. *Greywacke rocks.*

From several appearances of the strata, where sections can be had (as in several places of the Kirtle, a beautiful wooded stream, which flows into the Solway, more to the south than the river Annan) indicating strongly the presence of coal, it is probable that that valuable mineral may be discovered, but whether in beds of sufficient thickness to repay the expense of working, cannot be ascertained till further trials be made; and indeed from late attempts that have been undertaken in this quarter it seems very doubtful.

The soil of this lower basin of the Annan partakes very much of the characters of that which usually occurs in coal districts. It is of a stiff adhesive clay; but as this basin abounds in limestone, the means are at hand to obviate some of the defects of a clay soil. And by better dressing, with tiles or stones, the lime will produce more striking effects on the vegetation. The most fertile soil of this district is adjacent to the banks of the Annan, the Esk, the Kirtle, and some of their tributaries. The shortest and sweetest herbage is found growing on the greywacke and basaltic rocks contained in the limestone. The productive qualities of the soil of the limestone tracts are not great.

III. BASIN OF ESKDALE.

The river Esk, in its course from its source to the Solway Frith, flows through two basins, an upper and a lower. It is, however, difficult to distinguish the lower basin of the Esk from that of the Annan. They run so much into one another that a better

division of this lower district of Dumfriesshire would be to consider the two as one large basin.

1. *Upper Basin of the Esk.*—The upper basin contains neither coal, lime, nor sandstone throughout its whole extent, the prevailing rock being *greywacke.* The mountains which form the sides of the highest parts of Eskdale are high, having extensive grassy slopes, that yield to large flocks of sheep an excellent pasturage. From its source to Langholm, the Esk, joined by the Megget and the Ewes, runs in a straitened basin, which may be called the upper basin of the Esk. In the hills around the manse of Eskdalemuir, the *volcanic* or *ingeous rocks* abound; and among those most interesting to the mineralogist *pitchstone* may be named, which caps their summits, particularly those of Todshill, Castlehill, Watchcraig, and Watt Carrick. The pitchstone is of a dark colour. *Porphyry* is also seen in some places. At Glendinning the greywacke contains *grey antimony glance,* or sulphuret of antimony. In the same neighbourhood, among the mountains, there are traces of galena, or sulphuret of lead; and there can be little doubt, where the rocks of the greywacke are hard and compact, lead may yet be found in quantity.

About three miles from Langholm is the *Blough Well.* It is of a sulphureous description, similar to those at Moffat. The form of the mountains of Eskdale, and the kind of greywacke rock of which they are composed, indicate favourable appearances for the presence of lead and other metallic ores. Slate, also, for roofing, it is probable, will be met with in several places, when the hills are better examined.

2. *Lower Basin of the Esk.*—Below Langholm, the basin of the Esk expands, and to the west unites itself with the lower basin of the Annan, which may be called the lower basin of the Esk.

This basin contains, uppermost of them all, the new red sandstone, under it the coal formation series of strata, and the carboniferous limestone underlaying the coal stratification. The greyish-black beds of slate-clay, which alternate with the seams of coal, contain globular masses of *clay ironstone.*

At Byreburn, coal was formerly worked. The seams of coal were two in number, viz., one of five feet ten inches, of a good quality, having a small band of shale in the middle; the other two feet seven inches, consisting of coal and bituminous shale, fit only for burning limestone. These coal works for many years have been abandoned, and an extensive colliery has been opened at Rowanburn, in the same parish. To the S.E. of Byreburn, and in this Rowanburn colliery, several very valuable seams of coal are now worked, as the following list of strata, in the

general section of the strata from Rowanburn to Byreburn, &c., will shew.*

The coal formation of Canonbie is apparently not of great breadth, and has not been worked to the dip, or S. below the new red sandstone formation, and it is still undetermined if it is the out-crop of the Cumberland coal, or a distinct coal basin. The greyish-black beds of slate-clay, which alternate with the coal seams, contain globular masses of clay ironstone.

From Langholm, in the direction of Ecclefechan and Brownmuir, *carboniferous limestone* is found in all that range, in which are the same organic fossil remains as in the carboniferous limestone of Kelhead and Closeburn, and beyond, to the N. of this line, the greywacke.

The perpendicular section of the lower basin of the Esk is the same at the lower basin of the Annan, as seen in Fig. 4, Plate VII., viz. :—

No. 1. *Soil* containing alluvial matters.
2. New red sandstone.
3. Yellow sandstone.
4. *Coal*, found at Byreburn and Rowanburn.
5. *Carboniferous* limestone.
6. Greywacke rocks.

Section of Strata at Canonbie Colliery, Rowanburn, in Basin of Esk, shewn in Fig. 5, Plate VII.

	Yards.	ft.	in.		Yards.	ft.	in.
Cover of strata,	10	1	8	Brought over,	64	2	0
Shale,	1	0	0	Sandstone,	3	1	11
Coal, (foul,)	0	0	10	Sandstone, (dark,)	3	1	8
Sandstone,	0	1	3	Slate Clay,	2	2	4
Slate Clay,	5	0	11	Sandstone, (bands,)	13	1	3
Coal, (foul,)	0	0	10	*Coal*,	0	1	0
Shale,	2	1	0	Slate Clay,	0	2	6
Sandstone, (blue and red bands,)	17	2	8	*Coal*,	2	0	0
Coal,	0	0	2	Slate Clay,	4	0	0
Shale,	0	2	4	Sandstone,	2	0	1
Sandstone, (blue and white,)	5	2	8	Slate Clay,	20	2	7
Slate Clay,	0	0	10	Coal, (splint,)	3	0	0
Coal, (foul,)	1	0	4	Slate Clay,	4	0	1
Slate Clay,	8	1	6	Coal, (resting on sandstone,)	1	0	0
Carry over,	64	2	0	Total depth,	116	0	5

Strata dips S. 1 foot in 4 nearly.

The soil of the lower basin of the Esk is similar in all its characters and qualities to that of the lower one of the Annan.

* To Mr Edmund Gibsone, civil engineer, and manager of the Duke of Buccleuch's collieries, in the parish of Canonbie, we are much indebted for a valuable section of the strata from Rowanburn to Byreburn; for a geological map of that parish; and for a large collection of the minerals of that parish, now deposited in the Museum of the Highland and Agricultural Society.

Having thus hastily and rapidly run over the districts of Annandale and Eskdale, and, as briefly as we could, enumerated their mineral deposits, it may not be uninteresting to contrast them with each other.

In the upper basin of the Annan we have observed that there is neither coal nor lime—that its distance from those districts where those minerals abound has checked its advancement in improvement. The upper basin of the Esk, without coal, limestone, or sandstone, is still more unfavourably situated than that of the Annan, and its improvement must be necessarily retarded; but in the lower basins of the Annan and the Esk, both abounding in limestone, and the latter with both limestone and coal, though hitherto sufficient advantage has not been taken of these things, yet it is to be expected that the stiff, cold, tenacious clays, that cover so large a tract of these basins, will be ultimately improved, and rendered much more productive, when greater quantities of lime are employed in agriculture, and the system of tile-drainage more extensively introduced. The good effects of judiciously applying it to such lands is most gratifyingly witnessed on the estate of Warmanbie, whose public-spirited and intelligent proprietor, Mr Carruthers, has set an example to the whole neighbourhood by his successful improvements of a cold, stiff, clayey soil.

Although the upper basins of the Esk and the Annan are behind those of the Nith in mineral treasures and in improvements, yet if the local advantages of water for irrigation, everywhere so abundant in these two districts, were embraced, it may be presumed that the want of limestone might in some degree be compensated; for these two basins, shut in on all sides by lofty greywacke mountains, abound in streams which offer great facilities for irrigating the flat lands of the basins, in the months of spring, when unusually dry, and that of June. By this irrigation, and the raising of great additional quantities of hay, the numerous flocks fed in these districts, which are often, in the severe storms of winter, and in the dry cold springs, driven to great extremities for food, would be abundantly supported, and it is probable that, by these means, stock might be greatly increased, and brought sooner to market. The efficiency and successful application of water in flooding meadows or low lands, and thereby augmenting their annual produce in either grass or hay, has been clearly demonstrated by what has been done on the Closeburn estate in Nithsdale. Its proprietor, sensible of the value of water for meadow lands, has, at much cost, engineered a water-course of some miles in length, from the greywacke hills on the east of the basin of Closeburn; and, in another direction, another course of equal length, which collect in their passage every rivulet that descends

from the hills. These two canals are made to irrigate an extensive tract, producing a large increase of food, often upwards of 400 stones of hay the acre, being nearly twice as much as these grounds formerly yielded. These successful applications of water flooding for meadow lands afford a strong presumption, where the climate and soil are very similar, that this plan might be applied with advantage in the upper basins of the Annan and the Esk. It may be remarked that a command of water to flood grass lands is most valuable in the months of spring and June, when dry weather sets in, checking vegetation. Having a supply of water at that time to throw over the fields with the high temperature of the atmosphere, a vigorous and rapid growth of grass speedily is produced. We consider in the climate of Scotland, all things taken into view, that the application of water is most favourable at this period of the year. Great disappointment, however, and injury to the land has resulted from attempting irrigation in the winter time and the early months of spring. The proper season in Scotland to apply water to grass land is at the season of the year when the temperature of the air is greater, as in April, May, and June.

But the great advantage which the basins of the Nith derive from their *minerals* may be more fully seen by comparing them with the neighbouring basin of the Dee, which forms the greater part of the county of Kirkcudbright. This basin in its longest branch, that of the Deuch, commences nearly at the source of the Nith, runs almost parallel to that district, and is nearly of the same length. It does not rise to a greater height above the level of the sea, and may therefore be supposed not to differ much in climate; and the soil is, we believe, not inferior.

But when we compare the two districts with each other, we find a striking difference. Nithsdale, as we have seen, has abundance of *limestone*, *coal*, and *sandstone*, extending almost to the source of the Nith, admitting of houses being built well and cheaply, fuel being had at a trifling expense, and the land cultivated almost to the tops of the hills. But in the valley of the Dee, in Kirkcudbrightshire, there is neither coal, lime, nor sandstone, and we find in that tract nearly the whole upper part of it almost waste. No villages occur exceeding a few houses, and these indifferently built; the land, from want of lime, is uncultivated, and laid out mostly in extensive sheep farms; and there is little hay, except what is naturally produced for rearing of cattle, an evil which might probably be in some degree remedied by the use of irrigation, as already suggested in regard to the upper districts of Dumfriesshire. The leadworks at Carsphairn, lately opened and now extensively worked, are giving employment to a numerous population, which will occasion a market for the agricultural produc-

tions of that district, long wanted; and if a road were opened at the head of the Deuch, into the valley of the Afton, in New Cumnock parish, abounding with coal and limestone, very great benefits would be conferred on all this district of the Glenkens of Galloway.

Thus are these two districts in Galloway and Dumfriesshire in several respects similar as to situation, soil, climate, and extent, but widely different in improvement and population; and this difference arises chiefly from the superiority of the one over the other in mineral treasures. Nor is it to be thought that Nithsdale has from its minerals yet derived all the advantages of which it is capable.

It is not much above half a century since the roads in Nithsdale were passable for heavy carriages. Many of them were little better than horse tracks. Those in the basin of New Cumnock are badly directed, retaining the old packhorse line of road, and are not fitted for the conveyance of great weights, even for the single horse cart. It may, therefore be expected that great improvements will still be made when the roads are better directed, and railways have been introduced, so as to render communication easy, and the resources of the different parts of Nithsdale available for general use, and more expeditiously and at less expense transported to the markets of Edinburgh, Glasgow, and Liverpool.

REPORT OF EXPERIMENTS WITH CERTAIN SPECIAL MANURES.

By Mr John Finnie, Swanston, Mid-Lothian.

[Premium—Ten Sovereigns.]

These experiments were made on the crop of 1843, and at an elevation of 600 feet above the medium level of the sea.

Oats, Table I.—This table exhibits a comparative view of the results obtained from the application—1st, Of ground rape-cake, commonly called rape-dust; 2d, of ammoniacal salts; 3d, of common salt; 4th, of nitrate and sulphate of soda conjoined; 5th, of nitrate of soda by itself; 6th, of foreign guano; 7th, of British guano; 8th, of bones dissolved in sulphuric acid; and 9th, of ammoniacal liquid, used as top-dressings to a crop of oats, when fully covering the ground, each application (with two exceptions) at a given cost per imperial acre. This cost has been fixed at 24s., as being, in the opinion of the reporter, a sufficiently large expenditure for such purposes. Farmers, in general, find the expense of properly manuring their green-crop-break somewhat

I.—*Oats*—*Crop* 1843.

Substances Applied.	Quantity per Imperial Acre.	Cost per Cwt.	Cost per Imperial Acre.	Produce of Grain per Imperial Acre.	Produce of Straw per Imperial Acre.	Weight per Imperial Bushel.	Excess of Produce in Grain per Imp. Acre.	Excess of Produce in Straw per Imp. Acre.	Value of Excess of Produce of Grain per Imp. Acre, estimated at 20s. p. Quar.	Value of Excess of Produce of Straw per Imp. Acre, estimated at 4d. p. Stone.	Value of Excess of Straw and Grain per Imp. Acre.	Gain from Application.	Loss from Application.
	cwts. lbs.	L. s. d.	L. s. d.	qr. bu. pks.	sts. lbs.	lbs.	qr. bu. pks.	sts. lbs.	L. s. d.	L. s. d.	L. s. d.	L. s. d.	L. s. d.
Nothing, ...	— —	— —	— —	6 0 0	142 2	42½	— —	— —	— —	— —	— —	— —	— —
Ground Rape-Cake,	4 89.6	0 5 0	1 4 0	6 0 3	190 12	42½	0 0 3	48 10	0 1 10½	0 16 2	0 18 0½	— —	0 5 11½
Ammoniacal Salts,	1 22.4	1 0 0	1 4 0	6 6 3	185 5	42½	0 6 3	43 3	0 16 10½	0 14 4½	1 11 3	0 7 3	— —
Common Salt, . .	6 33	0 2 3	0 13 11½	6 7 2	166 10	42½	0 7 2	24 8	0 18 9	0 8 1¼	1 6 10¼	0 12 10¾	— —
Nitrate and . . . } Sulphate of Soda, . }	0 67.2 / 1 22.4	1 2 0 / 0 10 0	1 4 0	7 5 0	198 0	42½	1 5 0	55 20	1 12 6	0 18 7¾	2 11 1¾	1 6 10¼	— —
Nitrate of Soda, .	1 11.2	1 2 0	1 4 0	7 4 3	225 20	42½	1 4 3	83 18	1 11 10½	1 7 8	2 19 6½	1 15 4	— —
Foreign Guano, .	2 1	0 12 0	1 4 0	9 2 2	254 16	42½	3 2 2	112 14	3 6 3	1 17 7	5 3 10	3 19 8¼	— —
British Guano, .	3 0	0 8 0	1 4 0	9 0 0	226 6	42½	3 0 0	84 4	3 0 0	1 7 8½	4 7 8½	3 3 8½	— —
Bones dissolved in } Sulphuric Acid, }	4 0	0 6 0	1 4 0	6 6 3	176 0	42½	0 6 3	33 20	0 16 10½	0 11 3¾	1 8 2¼	0 4 2¼	— —
Ammoniacal Liquid,	0 65	Galls. at 4d. each.	1 1 8	6 0 2	176 0	42½	0 0 2	33 20	0 1 3	0 11 3¾	0 12 6¾	— —	0 8 1¼

II.—*Barley*—*Crop* 1843.

Substances Applied.	Quantity per Imperial Acre.	Cost per Cwt.	Cost per Imperial Acre.	Produce of Grain per Imperial Acre.	Produce of Straw per Imperial Acre.	Weight per Imperial Bush.	Excess of Produce in Grain per Imp. Acre.	Excess of Produce in Straw per Imp. Acre.	Value of Excess of Produce in Grain per Imp. Acre, estimated at 26s. p. Quar.	Value of Excess of Produce in Straw per Imp. Acre, estimated at 3d. p. Stone.	Value of Excess of Grain and Straw per Im. Acre.	Gain from Application.	Loss from Application.
	cwts. lbs.	L. s. d.	L. s. d.	qr. bu. pks.	sts. lbs.	lbs.	qr. bu. pks.	sts. lbs.	L. s. d.	L. s. d.	L. s. d.	L. s. d.	L. s. d.
Nothing, ...	— —	— —	— —	6 1 0	135 4	56	— —	— —	— —	— —	— —	— —	— —
Saltpetre, . . .	0 47.2	2 15 0	1 3 4½	6 2 0	154 0	56	0 1 0	18 18	0 3 3	0 4 6½	0 7 11½	— —	0 15 5
Nitrate of Soda and } Common Salt, . }	0 100.8 / 2 1	1 2 0 / 0 2 3	1 2 4	7 0 2	160 12	56	0 7 2	25 18	1 4 4½	0 6 5½	1 10 10	0 8 6	— —
Common Salt, . .	6 33	0 2 3	0 13 11	6 2 0	150 18	56	0 1 0	15 14	0 3 3	0 3 11	0 7 2	— —	0 6 9½
Foreign Guano, .	2 1	0 12 0	1 4 1¾	6 7 0	146 14	56	0 6 0	11 10	0 19 6	0 2 10½	1 2 4½	— —	0 1 9½
British Guano, . .	3 0	0 8 0	1 4 0	6 2 0	140 0	56	0 1 0	4 18	0 3 3	0 1 2½	0 4 5½	— —	0 19 6½
Bones dissolved in } Sulphuric Acid, }	4 0	0 6 0	1 4 0	6 1 0	150 0	56	— —	14 18	— —	0 3 8½	0 3 8½	— —	1 0 3½
Humus, ...	4 10	0 6 0	1 4 0	7 5 0	163 11	56	1 4 0	28 7	1 19 0	0 7 1	1 6 1	0 2 1	— —
Ammoniacal Salts,	1 22.4	1 0 0	1 4 0	7 3 0	210 16	56	1 2 0	75 12	1 12 6	0 18 10¼	2 11 4¼	1 7 4¼	— —
Nitrate of Soda, .	1 11.2	1 2 0	1 3 10	7 4 0	201 0	56	1 3 0	65 18	1 15 9	0 16 5½	2 12 2½	1 8 4½	— —
Ground Rape-Cake,	4 89.6	0 5 0	1 4 0	7 0 0	155 0	56	1 0 0	19 18	1 6 0	0 4 11½	1 10 11½	0 6 11½	— —

burdensome, without expending much more upon surface-dressings, which are liable to be influenced by the weather, such as rain or drought immediately succeeding; besides, as the system of alternate white and green crop, pasture excepted, has been proved most advantageous for Scotland, surely, if the green-crop-break be properly managed, the succeeding crop should be raised without much further outlay, and, therefore, unless a top-dressing can be procured at a moderate cost, it can never be expected to find its way into general use.

The fields selected for the experiments had been pastured for two years, and was ploughed so late as the 3d of March 1843, in consequence of a fall of snow, which did not leave the ground to admit of sooner proceeding with that operation. The lateness of ploughing evidently affected the crop of oats, the land being of light nature and moorish tendency, having a depth of eight or nine inches, with gravelly subsoil, and would have required consolidation, which earlier ploughing would have secured. The character of the soil may be described as scarcely of medium quality, having a southern exposure, and easily affected by drought. Previously to being pastured it was under a crop of barley, the immediately preceding crop being turnips, manured with Edinburgh street dung, and the third part consumed upon the ground by sheep. The field was sown upon the 20th of March 1843 with Blainslie oats, at the rate of six bushels per Scotch acre, and they were reaped on the 20th September. The different substances, as shewn in the table, were sown upon the surface on 13th May 1843. Rain immediately followed the application, but the succeeding day was dry and windy. Those exhibiting in the table the largest proportion of straw presented a marked difference in the course of a fortnight; but, as vegetation afterwards got no check, any further observations are not worth communicating. The results stated were carefully ascertained by measure and weight.

Barley, Table II.—This table gives the results from the application—1st, Of saltpetre; 2d, of nitrate of soda and common salt conjoined; 3d, of common salt by itself; 4th, of foreign guano; 5th, of British guano; 6th, of bones dissolved in sulphuric acid; 7th, of humus; 8th, of ammoniacal salts; 9th, of nitrate of soda; and 10th, of ground rape-cake. These substances were applied to a crop of barley in the same quantities and at the same rate of cost as in the preceding table.

This field has likewise a southern exposure and soil of medium quality, of a depth of eight or nine inches, sufficiently free for green crops, but rather having a tendency to clay, with a retentive subsoil. It has been all furrow-drained at eighteen feet apart. In 1842 it was under a turnip crop, manured with farm-court dung, intermixed with a proportion of cow-droppings

III.—*Tares—Crop* 1843.

Substances Applied.	Quantity per Imperial Acre.	Cost per Cwt.	Cost per Imperial Acre.	Produce.	Excess of Produce per Imperial Acre.	Value of Excess of Produce Estimated at L.5 per Imperial Acre.	Gain from Application.	Loss from Application.
	cwts. lbs.	L. s. d.	L. s. d.	sts. lbs.	sts. lbs.	L. s. d.	L. s. d.	L. s. d.
Nothing,	~ ~	~ ~	~ ~	846 8	~ ~	~ ~	~ ~	~ ~
Gypsum,	6 0	0 4 0	1 4 0	869 11	23 3	0 2 8¾	~ ~	1 1 3¼
Foreign Guano,	2 1	0 12 0	1 4 0	957 0	110 14	0 13 1	~ ~	0 10 11
British Guano,	3 0	0 8 0	1 4 0	935 0	88 14	0 10 5½	~ ~	0 13 6½
Nitrate of Soda,	1 11.2	1 2 0	1 2 0	990 0	143 14	0 16 11¾	~ ~	0 5 0¼
Humus,	4 0	0 6 0	1 4 0	980 0	133 14	0 15 9½	~ ~	0 8 2½
Nitrate of Soda and	0 67.2	1 2 0	1 4 3¼	1000 0	213 14	1 5 3¼	0 1 0	~ ~
Sulphate of Soda,	1 22.4	0 10 0						
Sulphate of Soda,	2 44.8	0 10 0	1 3 9½	920 0	73 14	0 8 8¼	~ ~	0 15 1¼
Bones dissolved in Sulphuric Acid,	4 0	0 6 0	1 4 0	868 15	22 7	0 2 7½	~ ~	1 1 4½
Ammoniacal Salts,	1 22.4	1 0 0	1 3 11	1000 0	213 14	1 5 3¼	0 1 4¼	~ ~
Ground Rape-Cake,	4 89.6	0 5 0	1 4 0	942 18	96 10	0 11 4¾	~ ~	0 12 7¼

IV.—*Grass—Crop* 1843.

Substances Applied.	Quantity per Imp. Acre.	Cost per Cwt.	Cost Imperial Acre.	Produce from Application.	Produce where Nothing Applied.	Difference in Favour of Application.	Difference Estimated at 7d. per Stone.	Gain from Application.	Loss from Application.
	cwts. lbs.	L. s. d.	L. s. d.	sts. lbs.	sts. lbs.	sts. lbs.	L. s. d.	L. s. d.	L. s. d.
Sulphate of Soda,	2 45	0 10 0	1 3 11	186 14	147 4	39 10	1 3 1	~ ~	0 0 10
Common Salt,	8 0	0 2 3	0 18 0	168 14	136 16	31 20	0 18 7½	0 0 7½	~ ~
Nitrate of Soda,	1 11	1 2 0	1 4 2	300 14	158 15	141 21	4 2 10	2 18 8	~ ~
Foreign Guano,	2 0	0 12 0	1 4 0	237 2	160 5	76 19	2 4 10½	1 0 10½	~ ~
Concentrated Manure,	6 0	0 4 0	1 4 0	196 13	165 3	31 10	0 18 4½	~ ~	0 5 7¾
Ammoniacal Salts,	1 22	1 0 0	1 4 0	235 3	165 0	70 3	2 0 10½	0 16 10½	~ ~
Sulphate of Ammonia,	0 89	1 10 0	1 4 0	232 4	142 7	89 19	2 12 5¼	1 8 5¼	~ ~
Saltpetre from Powder Works,	2 0	0 12 0	1 4 0	275 15	127 10	148 5	4 6 5½	3 2 5½	~ ~
Muriate of Ammonia,	0 24	5 12 0	1 4 0	185 11	122 13	62 20	1 16 8½	0 12 8½	~ ~
Sulphate of Magnesia,	0 96	1 8 0	1 4 0	131 4	131 4	~ ~	~ ~	~ ~	1 4 0
Saltpetre,	0 47	2 15 0	1 2 11	167 10	108 1	59 9	1 14 8	0 11 9	~ ~
Soot, 30 Bolls at 1/ per Boll,	~ ~	~ ~	1 4 0	296 13	148 5	148 8	4 6 6	3 2 6	~ ~

procured from Edinburgh cowfeeders: the whole of the crop was carried off the field. It was sown with common Scotch barley, at the rate of four imperial bushels per Scotch acre, on the 14th of April 1843, after receiving two ploughings, and reaped on the 1st of September. The top-dressings were applied on the 13th May 1843, and benefited from the rains which immediately followed. Upon those divisions shewing the largest proportion of straw a difference shortly became evident; but, as the season was afterwards favourable to vegetation, any further observations were in a great measure conjectural.

Tares, Table III.—This table represents the effects which followed from the employment—1st, Of gypsum; 2d, of foreign guano; 3d, of British guano; 4th, of nitrate of soda; 5th, of humus; 6th, of nitrate of soda and sulphate of soda conjoined; 7th, of sulphate of soda; 8th, of bones dissolved in sulphuric acid; 9th, of ammoniacal salts; and 10th, of rape-dust, as applied to a crop of tares, and at the same rate of cost as in the preceding tables.

This field is also exposed to the south, and has a very light soil, resting upon greenstone rock, which appears at various depths, and is often visible at the surface. In 1842 it was under a barley crop sown with grass seeds intended for hay. The drought, however, so completely burned up both clover and rye-grass, that it was deemed advisable to plough it for tares, which operation was performed on the 29th of March 1843, and the tares sown on the 1st of April following with a mixture of oats, in the proportion of four of tares to one of oats. The barley crop was preceded by turnips, well manured with a rich mixture of horse and cow dung, with a small proportion of Edinburgh street manure, and a third of the turnip crop consumed on the ground with sheep. The substances were applied on the 12th of May 1843, and had the benefit of the rain which immediately succeeded; no very decided effect was visible after the top-dressings. The table shews the result obtained—the tares being cut and weighed on the 10th August 1843.

Grass, Table IV.—This table represents the results obtained from the use of the following substances:—1st, Of sulphate of soda; 2d, of common salt; 3d, of nitrate of soda; 4th, of foreign guano; 5th, of concentrated manure; 6th, of ammoniacal salts; 7th, of sulphate of ammonia; 8th, of saltpetre from powder works, after having been used in making gunpowder; 9th, of muriate of ammonia; 10th, of sulphate of magnesia; 11th, of saltpetre by itself; and 12th, of soot, as applied for top-dressings to grass.

The field upon which the experiments were made is likewise exposed to the south, having a soil of the depth of eight or nine

V.—*Potatoes—Crop* 1842.

Substances Applied.	Quantity per Imperial Acre. (cwts. lbs.)	Cost per Cwt. (L. s. d.)	Cost per Imperial Acre. (L. s. d.)	Produce per Imperial Acre of Good Potatoes. (bol. fir. pks. lip.)	Produce per Imperial Acre of Small Potatoes. (bol. fir. pks. lip.)	Excess of Produce of Good Potatoes. (bol. fir. pks. lip.)	Excess of Produce of Small Potatoes. (bol. fir. pks. lip.)	Value of Excess of Produce of Good Potatoes, estimated at 8s. p. boll of 4 cwt. (L. s. d.)	Value of Excess of Produce of Small Potatoes, estimated at 4s. p. boll of 4 cwt. (L. s. d.)	Value of Excess of Produce of Great and Small Potatoes, at 8s. per Boll. (L. s. d.)	Gain from Application. (L. s. d.)	Loss from Application. (L. s. d.)
Manure, 28 tons at 8s. per ton = L.11 : 4s., . . .	.. ..	.. ..	.. ..	19 1 1 1	2 2 1 0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..
Sulphate of Soda and	0 56	0 10 0	0 17 6	22 0 2 1	0 1 0 0	2 3 1 0	2 1 1 0	1 2 6	0 9 3	0 13 3	0 4 0	.. ..
Nitrate of Soda, ...	0 56	1 5 0										
Sulphate of Soda and	0 56	0 10 0	1 0 0	20 1 2 1	2 3 1 0	1 0 1 0	0 1 0 0	0 8 6	0 1 0	0 9 6	.. ..	0 10 6
Sulphate of Ammonia, . .	0 56	1 10 0										
Soot, 32 Bolls, at 1s. per Boll,	.. ..	.. ..	1 12 0	20 1 3 0	3 0 1 1	1 0 1 3	0 2 0 1	0 8 10½	0 2 0¾	0 10 11¼	.. ..	1 1 0¾

Note.—The whole of the field was manured at the rate of 28 Tons of Farm-court Manure per Acre, and the above substances were applied in addition.

VI.—*Turnips—Crop* 1843.

Tons of Manure.	Price per Ton. (s.)	Cost of Manure. (L. s.)	Foreign Substances.	Quantity. (cwt. lb.)	Cost per Cwt. (L. s.)	Total Expense of Foreign Substances. (L. s.)	Total Cost per Imperial Acre. (L. s.)	Produce of Bulbs. (ton. cwt. lb.)	Produce of Stems. (ton. cwt. lb.)	Excess of Bulbs. (ton. cwt. lb.)	Excess of Stems. (cw. lb.)	Deficiency of Bulbs. (to. cw.)	Total Produce of Bulbs and Stems. (tons. cwt. lbs.)	Value of the whole Produce at 6d. per Cwt. (L. s. d.)	Gain from Application, taking Bulbs and Stems. (L. s. d.)	Loss from Application, taking Bulbs and Stems. (L. s. d.)	Gain from Application, taking Bulbs alone. (L. s. d.)	Loss from Application, taking Bulbs alone. (L. s. d.)
16	8	6 8	Nothing, ...	.. ..	.. ..	.. ..	6 8	20 8 0	4 16 0	.. ..	.. ..	.. ..	25 4 0	12 12 0	.. ..	.. ..	.. ..	.. ..
12	8	4 16	Bone-dust, ...	0 44.8	4 0	1 12	6 8	17 8 12	3 6 2	.. ..	.. ..	2 19	20 14 14	10 7 0¾	.. ..	2 4 11¼	.. ..	1 9 11½
12	8	4 16	Sulphate of Soda, .	3 22.4	0 10	1 12	6 8	22 4 16	3 0 2	1 16 16	.. ..	.. ..	25 4 18	12 12 1	0 0 1	.. ..	0 18 0	.. ..
12	8	4 16	Burned Bones, . .	1 67.2	1 0	1 12	6 8	16 4 12	3 12 2	.. ..	.. ..	4 3	19 16 4	9 18 0¾	.. ..	2 13 11¼	.. ..	2 1 11½
12	8	4 16	Rape-dust kept over year, . . .	6 44.8	0 5	1 12	6 8	19 16 14	3 6 2	.. ..	.. ..	0 11	23 2 16	11 11 0¾	.. ..	1 0 11¼	.. ..	0 5 11½
12	8	4 16	2d Quality Rape-dust,	6 44.8	0 5	1 12	6 8	21 0 15	3 12 2	0 12 15	.. ..	.. ..	24 12 17	12 6 1	.. ..	0 5 11	0 6 0¼	.. ..
12	8	4 16	Best quality Rape-dust,	6 44.8	0 5	1 12	6 8	25 4 18	4 16 3	4 16 18	0 3	.. ..	30 0 21	15 0 1	2 8 1	.. ..	2 8 1	.. ..
12	8	4 16	Inferior Linseed Cake,	6 44.8	0 5	1 12	6 8	24 0 17	4 4 3	3 12 17	.. ..	.. ..	28 4 20	14 2 1	1 10 1	.. ..	1 10 0¾	.. ..
12	8	4 16	Bones diss. in Sul. Ac.	5 30.	0 6	1 12	6 8	22 4 16	3 6 2	1 16 16	.. ..	.. ..	25 10 18	12 15 1	0 3 1	.. ..	0 18 0¾	.. ..
12	8	4 16	Humus, ...	10 73.6	0 3	1 12	6 8	22 4 16	4 10 3	1 16 16	.. ..	.. ..	26 14 19	13 7 1	0 15 1	.. ..	0 18 0¾	.. ..
12	8	4 16	British Guano, . .	4 0	0 8	1 12	6 8	21 0 15	4 10 3	0 12 15	.. ..	.. ..	25 10 18	12 15 1	0 3 1	.. ..	0 0 0¾	.. ..
12	8	4 16	Nitrate of Soda, .	1 50.	1 2	1 12	6 8	19 4 2	3 6 2	.. ..	.. ..	1 3	22 10 4	11 5 0	.. ..	1 7 0	.. ..	0 12 0
12	8	4 16	Ammoniacal Salts, .	1 67.2	1 0	1 12	6 8	28 4 10	5 2 3	7 16 10	6 3	.. ..	33 6 13	16 13 0¾	4 1 0¾	.. ..	3 18 0½	.. ..
12	8	4 16	Foreign Guano, . .	2 74.4	0 12	1 12	6 8	25 4 18	4 16 3	4 16 18	0 3	.. ..	30 0 21	15 0 1	2 8 1	.. ..	2 8 1	.. ..

inches, easily pulverized, but with a slight mixture of clay, there being a retentive subsoil. Young grass in spring presented such a poor appearance as to create some doubt in the reporter's mind whether it was prudent to let it stand for a hay crop. Ultimately he determined to top-dress it with soot, with the exception of that part reserved for experiments. No clover outlived the drought of the preceding year, so that rye-grass only was left. The substances were applied on the 13th of May 1843, and received the benefit of an immediate shower of rain. The most productive portions soon gave indications of increased luxuriance, and preserved that condition throughout the season. The grass was cut upon the 10th, and weighed upon the 15th of July 1843.

As the field appeared irregularly planted, the reporter reserved a portion of each ridge without any application, in order to test the effects produced. The propriety of doing so will sufficiently appear upon glancing the eye down the column where nothing was applied. All the ridges lay parallel, but in no case did they afford the same amount of produce, although the most practised eye could hardly have observed that such difference existed. The reporter, in all his experiments, on whatever crop, invariably adopted the same principle.

Potatoes, Table V.—This table exhibits a comparative view of the effects—1st, Of sulphate and nitrate of soda conjoined; 2d, of sulphate of soda and sulphate of ammonia conjoined; and 3d, of soot; upon a crop of potatoes in the season of 1842, in addition to twenty-eight tons of good farm-yard manure, well made, one-half applied in the autumn of 1841 and the other half in drill when the potatoes were planted in spring 1842. As the drought of that year injured the crop so severely, the reporter repeated the experiments in 1843, and intended to have given the results along with those of the preceding year. He had the mortification, however, to experience a disappointment by the entire failure of the crop.

The field referred to in this table is composed of a soil of better than medium quality, and easily affected with drought. It has a gravelly subsoil at the depth of about twelve inches, and exposed to the north. The potatoes were planted on the 25th of April 1842, at the rate of three bolls of four cwt. to the Scotch acre, and the substances applied on the 25th of June, and slightly hoed into the drill. No rain of any consequence followed, and the crop was raised and weighed on the 28th of September.

Turnips, Table VI.—This table shews the results from the application of the following substances:—1st, Of bone-dust; 2d, of sulphate of soda; 3d, of burned bones; 4th, of rape-dust, kept

one year; 5th, of rape-dust of second quality; 6th, of rape-dust of best quality; 7th, of inferior linseed cake; 8th, of bones dissolved in sulphuric acid; 9th, of humus; 10th, of British guano; 11th, of nitrate of soda; 12th, of ammoniacal salts; and 13th, of foreign guano; to a crop of turnips, in addition to sixteen tons of good farm-yard manure, well made, per imperial acre. These were applied upon a soil of rather good quality, having a retentive subsoil, at a depth of about twelve or thirteen inches. It is exposed to the north—was under a wheat crop in 1842—preceded by a potato crop manured with farm-court and Edinburgh street manure in equal portions.

It was sown with Skirving's purple-top yellow turnip seed on the 15th of June, and the substances were applied on the spread dung in drill, and the crop was weighed on the 1st of November 1843.

The reporter has intentionally abstained from making any observation expressive of his opinion as to the merits of the substances employed, which would be premature, until the results from other experimenters are obtained; but he cannot refrain from directing attention to the results exhibited in the table as applicable to the different qualities of rape-dust, shewing an increase of produce in proportion to its quality. The increase in the weight of the bulbs deserves particular notice, and the result of the whole proves to how great an extent the economizing of farm-yard dung may be practised in raising turnips—that invaluable crop for reproducing manure.

Globe Turnips, Table VII.—This table represents the comparative effects of the substances particularized in it when applied together and separately—at least as far as this trial went. The field manured with them is at an elevation of 1000 feet above the sea, and reclaimed from hill pasture ground in its natural state. The land is of a light nature, and well adapted for turnips, but rocky and inaccessible, and where farm-court manure could not be well applied, unless ploughed in upon the surface. The different substances were all spread evenly upon the surface, which, in the opinion of the reporter, rather gave the rape-dust an unfair trial. The reporter's general practice is, when using these portable manures, to make a mark with a plough in a straight line corresponding with the width he intends to make his drills, and to sow his portable manure along the line, so that the whole is placed immediately under the turnips when sown. He made this experiment with no intention of publishing the results, but more to satisfy himself as to the best method of applying such manures. Experience is decidedly in favour of what he represents as his general practice. Edinburgh street

manure, however, proves as well when spread on the surface, and slightly intermixed with the soil before the ridges for sowing the turnips are formed.

VII.—*Experiment with Globe Turnips sown from 20th to 25th June* 1843.

Manures Applied.	Cost per Imp. Acre.			Produce p. Acre. Bulbs alone.		Value per Imp. Acre, estimated at 6d. per Cwt.			Profit from the Application of Foreign Manure.			Loss from the Application of Foreign Manures.		
	L.	s.	d.	ton.	cwt.	L.	s.	d.	L.	s.	d.	L.	s.	d.
Edinburgh Street Manure, carriage included, 15½ cubic yards at 5s.= £3 : 17 : 6 per acre, . . .	3	17	0	11	5	5	12	6	...		...	...		...
Bones ½ in dust and ½ drill bones,	2	8	0	11	10	5	15	0	0	2	6	...		...
Rape-dust alone, ...	2	8	0	9	9	4	14	6	...		...	0	18	0
Guano alone, ...	2	8	0	17	2	8	11	0	2	18	6	...		...
Bones at a cost of 24s., and Guano 24s.	2	8	0	17	7	8	13	6	3	1	0	...		...
Rape-dust 24s., Guano 24s., . .	2	8	0	12	0	6	0	0	0	7	6	...		...
Rape-dust 24s., Bones 24s., . .	2	8	0	14	16	7	8	0	1	15	6	...		...
Rape-dust 16s., Bones 16s., Guano 16s.	2	8	0	13	12	6	16	0	1	3	6	...		...

Before concluding, the reporter submits a brief outline of his method of conducting experiments.

The substances were all weighed by himself and applied under his own eye. They were intermixed with a little earth, to make them spread equally, and then sown by the hand in top-dressings, when the crop was sufficiently advanced to afford a sufficient covering. They were all applied on the same day. The manure was carefully examined and weighed for each portion of ground. The corn crops were all raised and cut by the same individual, and thrashed out with the flail. The produce was measured and weighed by the reporter; the calculations bringing out the results shewn in the tables being made by a respectable land-surveyor, on whose accuracy he could depend. The produce of each ridge was compared with the produce of that portion of the same ridge to which no substance had been applied. This process he considered absolutely necessary to ensure correctness, as he had taken one ridge with another in former experiments, and obtained the most incorrect and unaccountable results.

The value of manure is stated at 8s. per ton, which may appear to some to be too high; but he considers it a fair estimate in his locality, (near Edinburgh,) and believes that he will be borne out in this by agriculturists.

REPORT ON EXPERIMENTS WITH SPECIAL MANURES.

By Mr Charles Stevenson, Redside, East Lothian.

[Premium—Ten Sovereigns.]

The characteristics of this season, 1843, (with the exception of spring, which was most genial,) having been sudden and extreme changes from heat to cold, and from cold to heat, while the changes from drought to wetness have been as sudden and as capricious, the rain some days falling in torrents—such a season will affect very considerably any of those saline manures which have been applied, or which may be already in the soil, more especially if the soil is much inclined and of a porous nature, as a considerable portion of these manures would be washed away, and, of course, their effects lessened. However, in dry soils, whether naturally so or by thorough draining, the rain, by these manures dissolving, would make their effects more striking than they would be in ordinary seasons; while for land naturally wet and of a retentive subsoil, where undrained, this has been a very unfavourable season. On every kind of crop the rain in May and June proved injurious, so much so on such soils, that they never thoroughly recovered. Few seasons, therefore, shewed more decidedly the advantages of thorough draining and subsoiling, hence the results of the different fertilizers in such a season will give more conflicting results than in ordinary ones. There is another very remarkable peculiarity of this season: the late crops (no doubt partly from the extremely beautiful weather in September) were by far the most prolific. There is, however, I suspect, another cause which I am afraid cannot be explained so clearly. In no season have I observed crops so much injured when laid on dry soils. In some seasons I have observed laid crops receive little or no injury; not so this season. Those early laid are not nearly so prolific as their appearance indicated. One reason may be, that generally the dashes of rain were accompanied with high winds, and the stalks of the grain broken, and injured for conveying the sap of the plant. Perhaps, also, the extreme coldness of the ground may, in some measure, have effected it. There is one circumstance that appears to me rather remarkable, that where the chemical manures were applied, the crops arrived sooner at maturity—this is generally not the case in ordinary seasons. I suspect there is some other latent cause forcing forward the growth of the plant, in some manner connected with electricity; but whatever might have been the cause, such was the fact. There is one experiment shewing that the effect of the nitrate of soda is not so *evanescent* as is generally supposed, and the effects are more decided on the third crop after the

application. There can be no doubt that one crop does not exhaust all the fertilizing power in one season, if the quantity applied is more than is required for that one crop; and I think the value of premiums would be much enhanced if the effect of the different applications were tested on *each crop through the whole rotation*, as, no doubt, under ordinary circumstances, where a large quantity of saline manure has been applied, its effects are in some degree, perceptible for a number of years: the value of them as fertilizers is, in fact, in some degree dependent on this result. Their continued effect could be ascertained now at comparatively little expense, and would more correctly determine, in a pecuniary point of view, their value, while the importance of the knowledge to the scientific inquirer would be great. I have reason also to know that the seed of grain which had grown on land reclaimed from the sea has a prolific power, which must be connected in some degree with the saline particles contained in the grain. With this view I have sent a boll of wheat grown after two of the different applications, viz., salt, saltpetre, and one where nothing was applied, to Ayrshire, to be there tested next season, imagining that a change of soil and climate would add to the value of the experiment. It will be observed, on looking over the report of the experiments annexed, that, upon the whole, the applications scarcely pay the cost of the manures and trouble. Their effects will, no doubt, be different on land which has been comparatively a short time under cultivation, or exhausted by injudicious management, or perhaps from local situations with regard to the sea, or some such causes. In cases like these the effects may be different; but if they *influence the produce throughout the whole rotation*, the result will add to their value in proportion to the effects thus produced. I have myself not the least doubt that they affect the whole rotation. The following experiments were conducted with as much attention as possible to have the soil in each division equal. With this view all the applications (on Nos. 1 and 2 excepted, which occupied only two ridges) extended over four ridges, being those generally ploughed together, two of them being ploughed by the horses turning to the right, and two of them by the horses turning to the left. That there is a decided difference in the produce of the different ridges is certain, and where the soil is thin, the difference will be still greater in those ridges turned to the left. To observe this it is only necessary to examine the different applications on the fallow wheat, where the produce of the two different ridges was weighed together. To have a correct experiment, it is essential that the application should extend over the whole four ridges. In a note-book kept for the purpose, all the

proceedings were marked at the time they were performed, and plans made of the different plots experimented on, the length and breadth as ascertained by the measuring chain, and marked on the sides of the plans; the observations being recorded as they were made: in short, everything connected with the experiments was noted down into this book. In applying the special manures to drilled crops, the number of drills being ascertained, the quantity for each drill was weighed as applied. Betwixt the different portions of beans, a row of potatoes was planted, to mark more distinctly the different plots. Where the experiments were made on young grass, a furrow was drawn with a plough across the ridges, betwixt the different portions, that the mowers in cutting the crop might more readily observe where to stop cutting. As a mark for the ends of the applications to the white crops, a straw rope was put across the ridges, and pegged down in each furrow with a forked stick; this also served to mark to the reapers where to stop cutting. All these precautions were found to be quite necessary when cutting the crops. On the portions experimented, the produce of each ridge was kept on the ridge where grown, and put up in a different form from the produce of the rest of the field, the more readily to distinguish them. *In carting the produce, equal portions of the plots were put on the cart,* each cart weighed and marked, and the whole produce of each portion was weighed when carted from the field; and in the cases of grain crops, afterwards thrashed, the grain was then measured and weighed, and the whole weight of the grain deducted from the gross weight, and this was marked as the weight of the straw and chaff. The grain was measured and weighed from the mill-fanners, finding that the respective quantities of good and grey corn depended, in a great measure, upon the speed of the hand-fanners.

The farm on which the following experiments were made is situated *from two to three miles from the sea*, the elevation of all the fields is much alike, and is about 100 feet above its level.

The following are tabular views of the portions of the different experiments as pointed out in the offer of the premiums:—

No. 1.—On the actual and comparative effects upon the Turnip Crop of the following substances, viz.:—Burnt Bones, Bone-dust, and Sulphate of Soda.

Each manure was applied to a quarter of an imperial acre, and compared with a similar portion having no specific manner applied to it; all the portions were equally manured with farm-yard dung, applied at the rate of twenty tons per acre; the specific manures were put upon the top of the dung. Seed sown, white Globe turnips. Preceding crops were in the following order:—Wheat

1842; beans 1841; oats 1840; grass 1839; barley 1838; white Globe turnips 1837.

Soil, strong stiff red clay. Subsoil of the same nature, resting on the old red sandstone. Depth of soil on the rock not ascertained. (For the analysis of this soil see Appendix, soil marked No. 2. For the analysis of the manures see also Appendix.) The exposure slightly to the south. Drained in 1835 with tiles every 32 feet. The turnips were sown on the 30th June; quantity of seed sown, about 5 lbs. per acre; crop weighed 9th November.

The following is a plan of the portions experimented on as required, with the addition of guano, and a plot with nothing:—

2. Sulphate of Soda, 56 lbs.	3. Bone-dust, 120 lbs.	5. Nothing.	=1½ imp. acre.
1. Nothing.	4. Burnt Bones, 120 lbs.	6. Guano, 112 lbs.	

Tabular View of the Results.

No.	Description of Manure.	Manure. Quantity applied.	Manure. Cost.	Weight of the whole as carted from the field.	Increase.	Decrease.	Weight of bulb.	Increase.	Decrease.	Weight of Stem.	Increase.
		lbs.	s. d.	tons. cwt.	ts. ct.	cwt.	tons. cwt.	ts. ct.	cwt.	tons. cwt.	cwt.
1.	Nothing,	...	...	3 18	...	...	3 0½	...	...	0 17½	...
2.	Sulphate of Soda,	56	3 0	3 14	...	4	2 16¾	...	3¾	0 17¼	...
3.	Bone-dust,	120	10 6	3 18¼	0 0¼	...	3 0¼	...	0¼	0 18	0½
4.	Burnt Bones,	120	10 6	3 19½	0 1½	...	3 1	0 0½	...	0 18½	1
5.	Nothing,	...	...	3 12	...	...	2 14	...	...	0 18	...
6.	Guano,	112	12 0	5 0	1 8	...	3 15	1 1	...	1 5	7

Remarks.—The two portions having no application differ considerably in their weight; I can only account for this from some difference in the quality of the soil. The heavy rains which fell in the end of May and the beginning of June prevented the sowing of the turnips in proper season; the land was also soured by the continued wetness. *Sulphate of soda* made little difference on the crop. The *bones* have had little effect, the soil being too stiff a clay for them to act on. Those after *guano* were the best. In fourteen days they looked superior and grew vigorously, shewing it to be a useful manure for turnips, by pushing them forward out of the reach of the fly. They, however, seemed a much greater crop than they proved to be when weighed.

The appearance which the crop presented.—On that portion to which the *sulphate of soda* had been applied, the leaf of the turnip had a lighter shade of green than the portion to which no special

manure was applied. *Burnt bones* and *bruised bones* shewed a darker shade of green. *Guano* were ready for singling a fortnight before the rest, and had the darkest shade of green.

No. 2.—Of the effect on the Potato crop of Soot, of a mixture of Sulphate and Nitrate of Soda, of the Sulphate of Soda, and of the Sulphate of Ammonia. (For analysis of the manures see Appendix.)

The potatoes planted were of the variety named Buffs. The previous crops were—Wheat 1842; beans 1841; oats 1840; grass 1839; wheat 1838; and turnips 1837.

Soil, a strong loam. Subsoil, a stiff yellow clay, stony. (For analysis of the soil see Appendix, No. 3.) The exposure, sloping to the south. A small portion of the field drained at the end of the ridges. The crop was planted on the 28th of April—the quantity of seed being about 3 bolls of 4 cwt. per acre. Unfortunately for such a wet season, they were planted every third furrow, the land having been previously manured with farmyard dung at the rate of 20 tons per acre, and the special manures sown on the top of the dung. The crop was lifted on the 2d of November and weighed.

The quantity of land in each plot was a quarter of an acre imperial.

Plan of the Portion Experimented on.

1. Sulphate of Soda and Ammonia.	2. Soot.	3. Sulphate and Nitrate of Soda.	4. Nothing.	=1 acre imp.

Tabular View of Results.

No.	Description of Manures.	Manures. Quantity applied.	Cost.	Weight of the whole.	Quantity of bolls of 4 cwt.	Increase.
		lbs.	s. d.	cwt.	bls. bsh. pks.	cwt.
1.	Sulphate of Soda and Ammonia,	28 28	1 6 5 3	8	2 0 3	...
2.	Soot, ...	160	5 0	10½	2 2 2	1¾
3.	Sulphate and Nitrate of Soda,	28 28	1 6 5 6	11	2 3 0	2¼
4.	Nothing, ...	...	...	8¾	2 0 3	...

Remarks.—It will be observed that the crop has been almost a failure. The rain in May and June completely drowned the land, which was almost all undrained, and is on stiff retentive snbsoil. As before observed, the potatoes were planted every third furrow in place of being *drilled*, and this added much to the evil of a wet soil and rainy season.

This experiment I therefore consider a failure, except as regards the useful hint it affords for future practice. There is one thing worthy of being recorded. Those sets which had the eye placed downwards almost all rotted, while those with the eye uppermost came away; care should therefore be taken in planting to place the sets so as the eye may be uppermost.

The only *practical* benefits derived from this experiment are —first, that it is unsafe to plant potatoes in such wet soils unless planted in drills; but even drilling in such a wet season would not have saved them, as the field adjoining, (farmed by its proprietor,) of similar soil, is also undrained, and there the potatoes were planted in drill, and also rotted. Both fields in 1841 were beans, and produced little more than the seed. Such soils, until they are thoroughly drained, are of comparatively little value.

From the crop being such a failure, I make no remarks as to the appearance of the crop when growing.

No. 3.—The effect of Saltpetre, Salt, and Nitrate of Soda and Salt mixed, upon wheat sown down with grass seed.

The following three series of experiments were tried, on wheat sown in October after summer fallow; on wheat sown in January after a turnip crop; and on young grass without a grain crop:—

First Series.—Wheat sown in the second week of October after summer fallow. The land was all equally manured with farm-yard dung at the rate of 16 tons per acre; on one-half of the field, the seed was sown on the top of the manure, and ploughed in with an ordinary furrow; on the other half, it was sown with a drilling machine; the quantity in both cases being about 2½ bushels per acre. On an acre and a-half of that portion where the wheat was sown with the drilling machine the manure was applied in the beginning of July, and was thus, in working the soil, more mixed with it, a quarter of an acre of which was marked off to be tested along with those portions having the special manures applied to them.

Unfortunately I left the field for a few minutes after ordering the servants to lead the whole of the field, except the portions experimented upon, and when I returned I found that a few of the stooks of this portion had been taken away, and fearing that, by replacing them, there might be some mistake, I had to lose sight of this interesting experiment. It looked quite superior to the rest, (the seed keeping the ground better in winter;) and on the quarter of an acre there were seventy two sheaves more of wheat than on that portion where the saltpetre had been applied.

The previous crops were—Oats 1841; beans 1840; grass 1839; wheat 1838; fallow 1837. Soil strong red clay, subsoil the same, resting on red sandstone. Depth of soil above the rock, from two to three feet. (For analysis of this soil see Appendix, No. 1.) The exposure slightly to the north. Drained, in 1836, with tiles and stones every 16 feet. Wheat, Hunter's variety, sown in the second week of October. Manures applied on the 8th of May, crop cut on the 17th September; weighed, thrashed, cleaned, and dressed on the 28th September. The quantity of land in each plot, one-fourth of an acre imperial.

Plan of Portion Experimented upon.

	1.00 ch.	1.00 ch.	1.00 ch.	1.00 ch.	1.00 ch.	1.00 ch.		
2.50 ch.	1. Manure applied in July, Farm-yard dung.	2. Saltpetre, 45 lbs.	3. Nitrate of Soda, 33 lbs., and Salt, 45 lbs.	4. Salt, 1 cwt.	5. Nothing.	6. Seed ploughed in along with the dung.	2.50 ch.	$= 1\frac{1}{2}$ acre imp.

Tabular View of Results.

No.	Description of Manures.	Manures. Quantity applied.	Manures. Cost.	Weight of the whole Produce.	Quantity of Wheat.	Weight per Bushel.	Increase.	Decrease.	Weight of Straw.	Increase.
		lbs.	s. d.	cwt. stones.	bush. lbs.	lbs.	lbs.	lbs.	cwt. lbs.	lbs.
5.	Nothing, . .	...	...	9 5 8 2 17 7	9 49	63	...	...	12 42	...
2.	Saltpetre, . .	45	11 7¾	9 5 8 5 18 2	9 42	63	...	7	12 91	49
3.	Nitrate of Soda and Salt, . .	33 45	6 5¾ 0 11¼	9 5 8 6 18 3	9 48	63	...	1	12 99	57
4.	Salt, ...	112	2 3	9 1½ 9 1½ 18 3	10 15	63	29	...	12 69	27
6.	Seed ploughed in,	...	...	10 4 10 4 21 0	9 38	63	...	11	15 67	cwt. lbs. 3 25
1.	Manure applied in July. Experiments spoiled as before explained.									

Remarks.—The crop, when drilled, was thin in the spring, but after being hoed with the hoeing machine, it improved rapidly, and, from the repeated deluges of rain, was latterly much lodged, which diminished the produce, especially of the ploughed-in portion. The portion to which nothing was applied, from being opposite to a gate which led into a grass plot, was a good deal eaten with hares. Had the season been drier, the portions of *saltpetre* and *nitrate of soda and salt* would have been more favourable, as at first they looked more luxuriant. After the crop was cut, there was no perceptible difference on the grass seeds, the crop, from being much laid, kept all down. On the night of the 9th of November, there was a severe frost, and the young grass on the portions of *salt, nitrate of soda and salt, and saltpetre*, became yellow.

Remarks on the appearance of the crop.—The effects of the saltpetre and nitrate of soda and salt were slightly apparent one month after application. The tip of the leaves of the wheat, where the salt was applied, became yellow eight days after the application.

Second Series.—Wheat sown on the 29th of January, (Hunter's variety,) quantity at the rate of $3\frac{1}{2}$ bushels per acre imperial. Previous crops—Turnips (purple top yellow) in 1842; wheat 1841; beans 1840; oats 1839; grass 1838; barley 1837; turnips 1836. Soil same as fallow field. (For its analysis see Appendix, No. 1.) The exposure slightly to the east, drained, in 1841, every 16 feet; drains filled with broken stones. Manures applied on the 8th of May; crop cut on the 23d of September; thrashed, weighed, &c. on the 7th October. Quantity of land in each plot, one-fourth of an acre imperial.

Plan of Plots Experimented on.

1.	2.	3.	4.	
Nothing.	Salt 112 lbs.	Nitrate of Soda 28 lbs., Salt 56 lbs.	Saltpetre 45 lbs.	=1 acre imp.

Tabular View of Results.

No.	Description of Manures.	Manures. Quantity applied.	Manures. Cost.		Weight of whole Produce.		Quantity of Wheat.		Weight per Bushel.	Increase.	Decrease.	Weight of Straw.		Increase.	Decrease.
		lbs.	s.	d.	cwt.	sts.	bus.	lbs.	lbs.	lbs.	lbs.	cwts.	lbs.	lbs.	lbs.
1.	Nothing, . . .	--		--	9 8 18	1 6½ 0	11	44	60	--	--	12	80	--	--
2.	Salt, ...	112	2	3	8 8 16	6½ 0 6½	10	53	60	--	51	10	8	--	296
3.	Nitrate of Soda, And Salt . .	28 56	5 1	6 1½	8 9 17	3 0 3	10	14	60	--	90	13	40	80	--
4.	Saltpetre, . .	45	11	7¾	7 8 15	1½ 3 4½	9	1	60	--	163	12	73	--	7

Remarks.—The whole crop looked sickly in spring, but recovered in April, and became a luxuriant one, the straw having a beautiful colour. Those portions manured with *saltpetre* and *nitrate of soda* looked flush by the 1st of June. The *salt* portion had the tip of the leaves brown, as happened also on the fallow wheat. The nothing portion, by the 1st August, looked best. In this experiment all the manures injured the produce. On the *saltpetre* and *nitrate of soda* portions the young grass grew so vigorously, that, when the wheat was cut, part of the clover was in blossom, no doubt to the injury of the wheat; had it been a drier season, or the field not in such high condition, the result might have been different.*

There is another experiment in this field alluded to in the preliminary remarks of the effect of *nitrate of soda* the third year after being applied. The experiment arose in this manner. In 1841, a quantity of nitrate of soda was applied at the rate of 1½ cwt. per acre on two ridges; the crop, wheat after beans.

* It will be observable by this experiment that the produce of wheat after turnips exceeded that after fallow on land of similar quality, viz., a stiff red clay, thus favouring the opinion of those who contend that turnips can be profitably raised on clay land if properly drained. I may observe that I could have obtained oilcake at a cheaper rate than reducing such stiff land for turnips. I may further remark that the produce through the rotation after turnips generally exceeded that after the fallow where the land is drained, beans and wheat excepted—these being inferior.

The effect was very visible in spring, but towards harvest there seemed but little difference from the rest of the field. The ridges were unfortunately not kept separate and tested. In the succeeding winter, the whole field was ploughed, about ten to twelve inches deep, with three horses abreast. In 1842 it was drilled, the drills running at right angles to the old ridges; the manure (farm-yard dung) applied in the drills, and turnips sown. The crop was poor, partly from the extreme drought in 1842, and partly from being rather late in being sown. It was removed in December, and the land ploughed up, the ridges laid as they formerly were, viz., at right angles to the drills, and sown with wheat on the 29th January. When the wheat brairded, the two ridges having the nitrate applied in 1841 came away more vigorously, and the difference has always been perceptible during the whole summer. In cutting, these two ridges were kept with other two that had no application: each two ridges were weighed and thrashed separately, and the following are the results:—On the two ridges having no application in 1841, the whole crop weighed 49½ cwts., quantity of wheat, 36 bushels 4½ lbs., weight of straw, 30 cwts. 19 lbs. The two ridges nitrated, applied in 1841, gave a gross crop of 55 cwts., quantity of wheat, 34 bushels 22 lbs., weight of straw, 36 cwts. 66 lbs.

The produce of wheat was in favour of no application; as other experiments shewed that nitrate affects the straw more than the grain. But there was another cause—the wet season laid the nitrated ridges much more than the others, and this would diminish the produce as much, or more, than the difference marked, shewing that nitrate does affect the succeeding crops. The same effect I have observed of saltpetre. In 1835 a field was sown with Swedish turnips; different manures were used to test their value—rape-dust, farm-yard dung, and one acre dressed with two cwts. of saltpetre, and no other manure applied. The whole field was a heavy crop; that by the saltpetre being fully the best. The turnips were let for sheep at £10 per acre. In the following season I did not perceive any difference in the appearance of the different portions. I should mention that the field had been in pasture for five years, and was therefore in the highest possible condition. In 1836 crop wheat; 1837 grass; 1838 oats; 1839 potatoes; 1840 wheat; 1841 Swedish turnips; 1842 wheat.

The wheat in 1842 was a very full crop, and on those four ridges where the saltpetre had been applied in 1835 were superior to the rest of the field, the wheat stubble even shewing a difference; the produce was not compared with another portion having no application of saltpetre in 1835. This marked superiority, however, induced me to undertake these experiments, with

the view of testing the value of saline manures. The reason assigned for the saltpetre being more visible in 1842 is, that the season being so extremely dry, the crops in general suffered for want of moisture, while the saltpetre in the soil of those ridges not only retained the moisture for the plant, but also absorbed it from the atmosphere, and the subsoil even was more moist than in the other part of the field. There can be no doubt but that it formed also new compounds in the soil, and thus stimulated the plant.

Another illustration—I inspected a field of barley on a farm of an eminent agriculturist. In 1841 he was induced to dress a field of barley (two ridges excepted) with saltpetre; in 1841 the crop exhibited no visible difference in looking at the field; in 1842 (turnips) the difference was not observable; but this season, (1843,) crop barley, the difference was very marked: there appeared to be at least a difference. of two quarters per acre. On the two ridges having no application, the barley was sickly, and a portion of it what is generally termed blighted.

I attempted the following experiment, but it was also destroyed by the inattention of those carting home the wheat:—The effect of straw as a manure, applied to wheat by being ploughed in before sowing. The quantity applied was about one half ton per acre. This experiment was made in two fields, one with wheat after beans, but the soil, being rocky, was unsuitefd or testing the produce, but the effect to the eye was very visible. On another field of stiff red clay the difference was very perceptible to the eye, and looked at least one quarter of wheat more per acre; the straw might, however, act mechanically upon the stiff soil in keeping it more open, and thus favour the crop in such a wet season. There is, however, great room for inquiry on this subject, as there can be no doubt that a very large per centage of the ammonia and other fertilizers of farm-yard dung escapes during the process of fermenting it for the soil, which process might to a certain degree be better accomplished in the soil itself. It is true, Liebig states, that ammonia is returned to the soil with the rain; but it has thus as much chance to fertilize other fields as our own. If we reflect on the large quantity of farm-yard dung made, and which might be increased on an arable farm, perhaps upon few subjects could the attention of agriculturists be more profitably directed than in ascertaining the proper state in which dung should be applied to the soil, and the best modes of applying it; and perhaps, by more perfectly incorporating it with the soil, it would not only add to the fertilizing power of the manure, by forming new compounds with substances already existing in the soil, but bring them more immediately into use for the roots of plants.

Third Series.—Saltpetre, Nitrate of Soda and Salt mixed, and Salt, on young grass without a grain crop.

The crop was cut for hay. Preceding crops—Wheat 1842; turnips 1841; barley 1840; beans 1839.

Soil a stiff red clay, subsoil of the same, depth of soil not known, resting on the old red sandstone. (For analysis of this soil see Appendix, No. 4.) Exposure to the north; drained, in 1836, every 32 feet with tiles. The special manures were applied on the 8th May; the grass cut and weighed in July; made into hay and weighed again in about eight days. Quantity in each portion, one-fourth of an acre.

Plan of Portion Experimented on.

1.00 chain.

3. Salt, 56 lbs.	4. Nothing.
1. Saltpetre, 45 lbs.	2. Nitrate of Soda, 56 lbs. Salt 56 lbs.

= 1 acre imp.

Tabular View of Results.

No.	Description of Manures.	Manures. Quantity applied.	Manures. Cost.		Weight when cut Green.		Weight of Hay.		Weight of Second Cutting.		Increase of Hay.	
		lbs.	s.	d.	cwt.	sts.	cwt.	sts.	cwt.	sts.	cwt.	sts.
4.	Nothing, ...	...	...		24	3	8	$4\frac{3}{4}$	6	0	...	...
1.	Saltpetre, ...	45	11	$7\frac{1}{4}$	27	1	11	$1\frac{1}{2}$	6	0	2	$4\frac{3}{4}$
2.	Nitrate of Soda and Salt,	56 56	11 1	0 $1\frac{1}{2}$	25	5	9	$1\frac{1}{2}$	6	2	0	$4\frac{3}{4}$
3.	Salt, ...	56	1	$1\frac{1}{2}$	24	3	8	$4\frac{3}{4}$	6	0	...	...

As the following experiment was nearly similar, and made on the same field, it will perhaps be better to give its results before making any remarks upon this.

No. 4.—The effect upon Grass cut for Hay of the Sulphate of Soda, Common Salt, and the Nitrate of Soda.

The *soil*, as formerly mentioned, is a stiff red clay. (For analysis see Appendix, No. 4.) Exposure to the north; drained every 32 feet with tiles in 1836.

In the hay there was a proper proportion of clover. Although bought for the common red, it appeared to be a mixture of different varieties, a proportion being cow grass, or perennial red clover.

This is a plan of the entire applications made on grass, according to Nos. 3 and 4 of the Society's List, with additions of *sulphate of ammonia, gypsum, and refuse of Roslin gunpowder works.*

Plan of Portion Experimented on.

No. 3.	Salt 56 lbs.	Nothing.	1. Sulphate of Ammonia 44 lbs.	
	Saltpetre 45 lbs.	Nitrate of Soda 56 lbs. Salt 56 lbs.	4. Gypsum 44 lbs.	= 3 acres imp.
No. 4.	Salt 224 lbs.	Nothing.	3. Refuse of Roslin Gun-powder 44 lbs.	
	Sulphate of Soda 45 lbs.	Nitrate of Soda 44 lbs.	2. Nothing.	

Tabular View of Results.

No.	Description of Manures.	Manures. Quantity applied.	Cost.		Date of Application.	Weight when Green.		Weight of Hay.		Increase of Hay.		Decrease of Hay.		Weight of Second Cutting.		Increase.		Decrease.	
	No. 4.	lbs.	s.	d.		cwt.	sts.	cwt.	sts.	ct.	sts.	ct.	sts.	ct.	sts.	ct.	sts.	ct.	sts.
	Nothing, . . .	~	~	~	~ ~	24	3	8	6	~	~	~	~	7	1	~	~	~	~
	Salt, ...	224	4	6	Apr. 7	15	$4\frac{1}{2}$	6	3	~	~	2	3	2	3	~	~	4	0
	Sulphate of Soda,	45	2	$4\frac{3}{4}$	Apr. 7	29	1	11	2	2	4	~	~	11	0	3	7	~	~
	Nitrate of Soda, .	44	8	$7\frac{1}{2}$	Apr. 7	31	0	13	6	5	0	~	~	8	6	1	5	~	~
1.	Sulphate of Ammon.	44	8	3	May 8	28	4	11	5	2	5	~	~	4	2	~	~	4	
2.	Nothing, . . .	~ ~		~	~ ~	25	1	9	0	~	~	~	~	9	0	~	~	~	~
3.	Ref. of Gunpowder,	44	5	6	May 8	28	6	10	3	1	3	~	~	6	6	~	~	2	2
4	Gypsum, . . .	44	1	$6\frac{1}{2}$	May 8	24	0	7	7	~	~	1	1	6	1	~	~	2	7

Remarks.—The effect of the saltpetre in No. 3 was visible nine days after it was applied, and forced forward the grass, which, when cut, was almost in a state of hay.

The effect of the sulphate of soda was not very perceptible till towards the middle of June. It had evidently a powerful effect upon the clover, making it grow more vigorously, and when made into hay the difference was still more observable; it had also a marked effect on the second cutting, but not so great as the table would indicate, as the clover on that portion, as well as the nitrate of soda, were cut before a severe night's frost in October. As for the *nitrate of soda, sulphate of ammonia, saltpetre, and the*

refuse of Roslin gunpowder, their effects were visible eight days after being applied, and, by the first of June, were very marked; but, before being cut in July, the other portions, to which nothing had been applied, made rapid advances on them. Salt, when applied in large quantity, seemed to have a prejudicial effect; when applied in small quantity its effect was not perceptible. On the portion where it was applied in large quantity, eight days after the application there was a severe frost—this blackened the leaves of the clover, and the most of the plants died out. The rye-grass, although short, had more seed upon it than the other portions. When applied along with the *nitrate of soda*, it appeared to counteract the effects of the soda. On land situated near the sea, it would appear from these experiments that salt is injurious; this, in all probability, arising from the quantity of salt already in the soil, perhaps also in the rain and in the atmosphere. On the portion where the *sulphate of ammonia* was applied, the leaves of the clover were cut with some small insects.

It will be observed that the weight when cut green and when made into hay varies very considerably; this arises in a great measure from those portions having the grass riper than the others: on the *nitrate of soda* portion, the grass was almost hay before it was cut. From the extremely wet weather, the cutting was delayed, in the hopes of a change for the better, which did come. All the portions, however, were cut dry and weighed immediately. From the luxuriance of the first crops, the second cutting was comparatively small, and on some of the portions, such as *sulphate of ammonia and nitrate of soda*, the clover plants in some measure died out.

Upon another field, to the east of the last, was a crop of rye-grass, for saving a second year's growth. The following substances were applied:—Farm-yard dung, compost of lime and earth, nitrate of soda, saltpetre and soot.

The soil is a red clay. (For analysis see Appendix, No. 2.) Subsoil also stiff clay. Exposure partly to the north and partly to the south. The field was furrow-drained in 1837, every 36 feet, with tiles and stones placed above them. Preceding crops —Hay cut for seed in 1842; barley 1841; turnips 1840; wheat 1839; fallow 1838; &c. The hay was cut in July and weighed after being sufficiently won.

The following tabular view shews the applications and their results. The manures were applied to a certain number of ridges, which were measured after the hay was cut:—

Tabular View of the Results.

No.	Manures Applied.	Quantity of Manures.	Cost.	Date of Application.	Weight of Whole.	Increase.
			s. d.		stones.	stones.
1.	Nothing, . .	... ...	... ...	... ...	110½	... ...
2.	Farm-yard dung,	At the rate of 6½ tons per acre @ 5s. per ton.	32 6	Feb.	131¼	20¾
3.	Lime and Earth,	16 Bolls of Lime per ac. Expense of mixing with earth about 60s. per ac.	60 0	Feb.	113½	3
4.	Nitrate of Soda	179 lbs. per acre.	35 3	Apr. 7	204	93½
5.	Saltpetre, . .	112 lbs. per acre.	29 0	May 8	153½	43
6.	Nitrate of Soda	112 lbs. per acre.	22 0	June 10	180½	70
	and Soot, . .	12 Bushels per acre.	6 9	Apr. 7		
7.	Soot, ...	12 Bushels per acre.	6 9	May 8	134½	24

Remarks—The effect of the *nitrate of soda* was visible in both applications eight days after being applied. When applied in April the crops came to maturity at least fourteen days before the rest of the field. When applied so late as the 10th of June, the crops made great progress in a short time, and, when cut, had a dark-green colour. It is somewhat remarkable that the lime and earth had so little effect: this, however is in accordance with what I have already experienced in this field. In 1832 a portion of this field (not the part experimented on) was trenched with the spade sixteen inches deep, planted with potatoes, and limed at the rate of thirty bolls per acre. Since that time there has not been the slightest perceptible difference between the portions limed and unlimed, and the part trenched, though repeatedly dressed with manure, is not yet equal to the rest of the field.

No. 5.—The effect upon Potato Oats, on newly ploughed lea, of Ammoniacal Liquor, a mixture of Sulphate and Nitrate of Soda, and Bones dissolved in Sulphuric Acid.

The lea was two year's pasture after wheat, after fallow, &c. Soil stiff red clay. Exposure, gently sloping towards the south, drained, in 1839, every 16 feet with tiles.

The oats were sown in April, with a drilling machine, at the rate of three bushels per acre, and were hand-hoed in June; the special manures were applied four days previous to sowing them; the crop was cut on the 25th of September; weighed, thrashed, and measured on the 7th October.

Plan of the Portions Experimented on.

4. Sulphate and Nitrate of Soda.	1. Nothing.	3. Bones dissolved in Sulphuric Acid.	2. Ammoniacal Liquor.	=1 imp. acre.

Tabular View of the Results.

No.	Description of Manures.	Manures. Quantity applied.		Manures. Cost.		Weight of the whole.		Quantity of Grain.		Weight per Bushel.	Increase.		Weight of Straw.		Increase.	Decrease.
		gal.	lb.	s.	d.	cwt.	sto.	bush.	lbs.	lbs.	bush.	lbs.	cwt.	lbs.	lbs.	lbs.
1.	Nothing,	...			...	9	2	10	$2\frac{1}{2}$	42	...		5	54	...	...
2.	Ammoniacal Liquor,	96	0	4	0	10	$3\frac{1}{2}$	10	$24\frac{3}{4}$	42	0	$22\frac{1}{4}$	6	53	111	...
3.	Bones dissolved in	0	100	9	0	10	0	10	21	42	0	$18\frac{1}{2}$	6	7	65	...
	Sulphuric Acid,	0	40	5	0											
4.	Sulphate and Nitrate of Soda,	0	20	1	$0\frac{3}{4}$	10	$6\frac{1}{2}$	12	$0\frac{3}{4}$	42	1	$40\frac{1}{4}$	5	$34\frac{1}{2}$	...	$19\frac{1}{2}$
		0	20	4	$4\frac{3}{4}$											

Remarks.—The ammoniacal liquor was diluted with two parts water to one of the liquor before being applied. I found it impossible to dissolve the bones with sulphuric acid, even after consulting Liebig's chemistry, and I delayed sowing the oats, expecting they might dissolve. The soil has too much clay for bones acting. In looking at the field there appeared to be no difference of the several manures. I observed the portion with the sulphate and nitrate of soda, when cut, was partially laid; the rest standing. I certainly expected greater results from the bones, and especially the sulphuric acid. A neighbouring farmer has dissolved bones this season for turnips; he sifted out the dust of the bones and applied the acid to it, and, after adding water, applied them in a liquid state in the drill. He states it to be a cheaper manure than guano and equal in its effects.

No. 6.—The effect upon Beans, Pease, and Tares, of Gypsum, Sulphate of Soda, and a mixture of Sulphate and Nitrate of Soda.

Previous crops—Wheat, grass, barley, turnips, oats, grass, &c. Soil stiff red clay; depth betwixt two and three feet; subsoil the same, resting on the old red sandstone. (For analysis see Appendix, No. 1.) Exposure slightly to the north and east. Drained, in 1835, every 32 feet with tiles.

Beans sown on the 21st March. The field was all previously manured with farm-yard dung in November 1842, upon the stubble, and ploughed in. The chemical manures were applied in the drills before the beans were sown. After the manures were put into the drills, they were hoed with graip hoes to prevent the seed coming in contact with the manures.*

* Part of the ground was trenched, in December 1841, in the following manner:—Two horses turned over the sod, a plough with four horses followed, and went about fourteen inches in depth. The previous crop to the beans was wheat after grass. The produce was equal; but there was one boll more of good wheat, and one boll less of light than on equal portions of ground beside it. The wheat on the trenched portion looked sickly in May, but soon recovered.

There is one fourth of an acre in each plot, except in the extra dung plot, and the extra part of nothing.

Plan of the Portions Experimented on.

<table>
<tr><td></td><td>.50. ch.</td><td>1 00.</td><td>1.00.</td><td>.50.</td><td>.25.</td><td>.25.</td></tr>
<tr><td rowspan="2">5.00. ch.</td><td rowspan="2">5.
Trenched.</td><td>4.
Sulphate of Soda.</td><td>1.
Nothing.</td><td rowspan="2">6.
Guano.</td><td rowspan="2">7.
Nothing.</td><td rowspan="2">8.
Extra Manure.</td></tr>
<tr><td>2.
Gypsum.</td><td>3.
Sulphate and Nitrate of Soda.</td></tr>
</table>

Tabular View of Results.

No.	Description of Manures.	Date of Application.	Manures. Weight.	Manures. Cost.	Weight of the whole.	Weight of Grain.	Weight per Bushel.	Increase.	Decrease.	Weight of Straw.	Increase.	Decrease.
			lbs.	s. d.	cwt. sts.	bus. lbs.		lbs.	lbs.	cwt. lbs.	lbs.	lbs.
1.	Nothing, . .	– –	—	– –	16 6	8 36	62	– –	–	12 0	– –	– –
2.	Gypsum, . .	Mar. 18	90	1 7¼	16 6	9 5	61½	30½	–	11 85½	– –	26½
3.	Sulph. of Soda, Nitrate of Soda,	. . 20	44 44	2 4¼ 8 7½	18 3	9 31½	62½	58	–	13 8	120	– –
4.	Sulphate of Soda,	. . 18	90	4 9¾	14 6	8 2	62½	– –	34	10 30	– –	194
5.	Trench ploughed in 1841	– –	—	– –	17 1	10 46	61½	133	–	11 25	– –	87
6.	Guano, . .	. . 20	67	7 2	19 0	10 3	62	91	–	13 49	161	– –
7.	⅛ acre, Nothing,	– –	—	– –	8 2	4 14	62	– –	–	4 102	– –	– –
8.	⅛ ac. additional Manure, .	. . 20	tons. 15	10 0	8 4	5 25	62½	73½	–	5 54½	64½	– –

Remarks.—The beans were through the ground three weeks after being sown. None of the manures applied appeared to have produced any favourable effect, with the exception that they always maintained a darker shade of green, which was observable at least three hundred yards off. The whole field was very luxuriant.

After a thunder storm in July, on that portion dressed with *gypsum* the leaves of the beans became brown. An attempt was made to separate the pease and tares from the beans without success.

I shall now sum up the results of my experiments in regard to the beneficial or prejudicial actions of the several manures.

Gypsum had a decidedly injurious effect on the crops it was applied to. *Bone-dust* and *burnt bones* were of little service ; but the soil on which they were used was very stiff clay, which prevented their proper action. *Bones* dissolved in *sulphuric acid* had little effect, but the experiment was not very fairly tried,

owing to the difficulty experienced in preparing them in the proper form.

Saltpetre, nitrate of potass, affected the grass crop powerfully, but when applied to wheat, injured it, by forcing forward the young grass. *Nitrate of soda* had a powerful effect on all the grass crops, and its action upon wheat, grown upon soil to which it had been applied two years previous, was very marked. This effect, however, might in part be owing to new combinations formed with dung applied in 1842.

Salt appeared in all its applications to be injurious.

Sulphate of soda increased the growth of clover, but injured beans, and had almost no effect on the turnip crop.

Sulphate of ammonia had a powerful effect upon grass, but two great a quantity was applied.

Ammoniacal liquor had little effect.

A mixture of *sulphate and nitrate of soda* had very good effect on the soils they were applied to; but this may all be owing to the *nitrate of soda*.

Refuse of gunpowder works proved a cheap and powerful dressing for grass.

In reference to all these manures I would draw attention to the circumstance already hinted at, that if they only affect the crop to which they are applied, they will hardly repay the expense, at least on land which has been some time in cultivation. The effect, however, may be different on land newly reclaimed, and which has not been dressed many times with farm-yard dung. On land long cultivated, I have attempted to prove that their effects extend at least through a whole rotation.

It seems desirable that experimentalists should watch their effects for a succession of years, and not hastily decide on their value as fertilizers from their action during only one season, or even one rotation.

With these remarks I conclude. The accompanying analyses of soils and manures were made by Dr Wilson, lecturer on chemistry. The soils are referred to by numbers in the essay, and the analysis of the manures will suit every experiment, as the same manures were used.

REPORT ON THE COMPOSITION OF SOILS AND MANURES

Referred to in this Essay.

By George Wilson, M.D., Lecturer on Chemistry, Edinburgh.

Four of the soils referred to in the preceding paper were sent for analysis along with four others derived from another quarter but included in the same arrangement. In addition to these

there were five parcels of manures, and the limited time afforded for the analysis of the whole made it impossible for me to ascertain more than the principal ingredients of the several soils.

The only points ascertained therefore were—the proportion of clay and sand in each, the amount of water and organic matter, and the nature of the soluble salts.

Soils.—The amount of water was ascertained by exposing a weighed portion of the soil, in a shallow basin, to a temperature of about 300° Fahrenheit. The organic matter was the additional loss sustained by the soil when exposed to a red heat in a wide open porcelain crucible. The clay and sand were determined by thoroughly mingling a known weight of the soil with water in a mortar, and separating the clay by decantation. The numbers given are the mean of three trials.

The soluble salts were determined in the ordinary way—by boiling the soil with distilled water—filtering—evaporating to dryness to aggregate the clay—exhausting with distilled water—and applying to the clear liquid obtained by filtration the necessary reagents.

Nitrate of silver and oxalate of ammonia were the only tests which gave distinct indications with all the soils; so that chlorine and lime appeared to be the only soluble constituents common to all of them.

Nitrate of baryta gave a slight precipitate with the soils marked 2, 3, and 4. But want of time prevented this branch of the inquiry being more minutely investigated.

The composition of the soils is given in a tabular form below.

	No. 1.	No. 2.	No. 3.	No. 4.
Water,	12.4	6.2	7.4	9.
Organic Matter,	1.8	6.	4.2	1.4
Sand,	65.2	74.4	73.4	74.1
Clay,	20.6	13.4	15.	15.5
	100.	100.	100.	100.

Soil No. 1 was sown with beans, wheat, and oats.

The beans were manured with gypsum, sulphate of soda mixed, and guano, (extra.)

The wheat was dressed with saltpetre, salt, and nitrate of soda and salt mixed.

The oats were dressed with ammoniacal liquor, bones dissolved in sulphuric acid, and sulphate and nitrate of soda mixed.

Soil No. 2 was sown with turnips and grass.
The turnips were manured with bone-dust, burnt bones, sulphate of soda, guano, (extra.)

Soil No. 3 was planted with potatoes and manured with soot, sulphate of soda, and sulphate of ammonia, sulphate and nitrate of soda.

Soil No. 4 sown with grass and manured with sulphate of soda, nitrate of soda, salt in large quantity, refuse of Roslin gunpowder works, gypsum, sulphate of ammonia, saltpetre, nitrate of soda and salt mixed, salt in small quantity.

The specimens of these soils sent for analysis had been dug up and dried in the beginning of spring, before any of the saline manures were applied to them. They were readily reduced to fine powder in a mortar, and contained very few stones, vegetable fibres, or other considerable masses. Some small quartz pebbles were picked out, and here and there particles of carbonate of lime could be detected on a close inspection; otherwise they were in a most favourable condition for analysis.

Saline Manures.—The manures sent for examination were, saltpetre, (nitrate of potass,) nitrate of soda, sulphate of soda, sulphate of lime, (gypsum,) and sulphate of ammonia.

Nitre or Saltpetre.—The nitre was of a pale brown colour and very impure. It deflagrated slightly when thrown on red hot coals, crackled and split into fragments like common salt. Instead of the peculiar cooling taste which true nitre possesses, it had a sharp saline one; and, when examined more closely, was found toconsist of two distinct sets of crystals; the one being made up of imperfect six-sided prisms of true nitre, (nitrate of patass,) the other of imperfect cubes of common salt, (chloride of sodium.) The proportion of the latter was ascertained to be not less than thirty nine per cent. of the whole so-called nitre. Some insoluble matter accompanied the crystals, and they contained four per cent. of water. There was not more therefore than about fifty six per cent. of pure nitrate in the sample. The following was its exact composition:—

Water,	4.0
Insoluble Matter,	0.3
Chloride of Sodium,	39.0
Dry Nitrate,	56.7
	100.

Nitrate of Soda.—The nitrate of soda occurred in the form of imperfect cubical crystals of a brown colour, deliquescent and adhering together. It contained, besides water and insoluble matter, about eight per cent. of chloride of sodium, and little

more than eighty per cent. of the pure dry nitrate. Its exact composition was:—

Water,	10.
Insoluble Matter,	1.3
Chloride of Sodium,	8.3
Dry Nitrate,	80.4
	100.

Sulphate of Soda.—The sulphate of soda was in the state of a white powder which had aggregated through keeping. It was quite soluble, and no impurity was detected in it but water to the extent of twenty-five per cent. It contained therefore seventy-five per cent. of dry sulphate.

Water,	25.
Sulphate of Soda,	75.
	100.

Sulphate of Lime, (gypsum.)—The gypsum was in the form of a pale cream-coloured powder. It did not effervesce with acids, and, except a little iron, contained no impurity but water to the extent of eighteen per cent.

Water,	18.
Dry Salt,	82.
	100.

Sulphate of Ammonia.—The sulphate of ammonia presented itself in the state of long prismatic crystals imbedded in a greenish-black moist substance, the whole being very deliquescent. The crystals dissolved out from the mixture when the whole was digested in water, forming a solution which passed quite colourless through the filter. When the crude sulphate was heated to full redness, the blackish-green matter burned away, and a fixed residue remained, consisting of alkaline sulphates. These impurities were not particularly examined, the inquiry being limited to ascertaining the proportion of pure sulphate of ammonia in the crude salt. It amounted to thirty-five per cent. of the whole.

The composition of the several manures is given in a tabular form below; the last column shewing the per-centage of pure dry salt in each of the commercial samples.

	Insoluble Matter.	Chloride of Sodium.	Water.	Pure dry Salt.
Nitrate of Potass,	0.3	39.0	4.0	56.7
Nitrate of Soda,	1.3	8.3	10.	80.4
Sulphate of Soda,	—	—	25.	75.
Sulphate of Lime,	—	—	18.	82.
Sulphate of Ammonia,	—	—	—	35.

The proportion of water given in this table is probably higher for all the salts than it should be—at least higher than it was

when they were used as manures; for they had been kept some six months before they were sent to me, and had certainly gained instead of losing water. As there was no data, however, from which to calculate the amount of moisture they had absorbed, nor any means of ascertaining their state of dryness at the time of their employment, I have attempted no correction, but put down the water exactly as I found it.

RESULTS OF EXPERIMENTS TO PROVE THE BEST DEPTH OF COVER FOR CERTAIN GRASSES AND CLOVERS.

By S. D. Stirling, Esq., of Glenbervie, near Falkirk.

No. 1, Section of Cover ½ inch deep.				No. 2, Sec. of Cover from 0 to 3 in. deep												
W[illegible] Sown	Average Inch.	Kind of Plant Experimented on.	Total of each kind.	0	¼ Inch.	½ Inch.	¾ Inch.	1 Inch.	1¼ Inch.	1½ Inch.	1¾ Inch.	2 Inches.	2¼ Inches.	2½ Inches.	2¾ Inches.	3 In. Total of each kind.
8	29	*Lolium perenna*, (Perennial Rye-Grass,)	348	29	30	27	19	16	19	14	12	11	9	8	4	198
15	23	.. *Italicum*, (Italian Rye-Grass,)	276	24	21	20	13	13	10	11	8	9	6	5	5	145
7	25	*Dactylis glomerata*, (Cock's-foot,)	300	30	22	15	15	10	9	7	5	2	..	..	..	115
13	26	*Festuca elatior*, (Larger Fescue,)	312	29	24	20	16	13	13	11	9	4	2	1	..	142
9	27	.. *pratensis*, (Meadow do.)	324	28	28	16	12	10	6	9	4	2	2	..	..	117
6	29	.. *hyterophilla*, (Various leaved do.)	348	31	23	20	18	12	9	6	4	1	..	..	..	124
6	30	.. *duriuscula*, (Hard do.)	360	30	23	10	15	10	8	5	3	1	..	..	..	114
13	16	*Alopecurus pratensis*, (Meadow Fox-tail,)	19[illegible]	17	17	16	15	12	7	6	3	1	..	..	..	94
3	44	*Phleum pratense major* (Timothy Grass,)	528	52	39	37	19	16	15	7	5	..	..	..	..	190
9	19	*Poa nemoralis sempervirens*, (Evergreen wood Mead-Grass,)	228	24	14	4	1	..	..	..	..	..	..	..	..	43
6	21	*Plantago lanceolata*, (Rib-Grass,)	252	22	25	19	17	14	11	10	8	6	2	..	..	134
4	16	*Trifolium pratense*, (Red Clover,)	192	17	16	14	11	11	8	4	4	..	..	..	..	85
3	12	.. *repens*, (White do.)	144	13	11	6	4	3	1	..	..	..	..	..	..	38
10	8	*Medicago lupolina*, (Yellow do.)	96	12	10	8	6	4	2	..	..	..	..	..	..	42
	325		3900	358	303	241	181	144	118	90	65	37	21	14	9	1581

Sown 1st July, Counted 1st August 1844.

The above experiment was made with a view to ascertaining the exact depth at which each kind of seed sown would grow most abundantly. In 1842, Messrs Drummond & Sons of Stirling made a similar experiment at my suggestion, the results of which were exhibited at the Show in Edinburgh; but, as garden experiments are laughed at by some, and as the difficulty still remained as to the treatment in the field necessary to obtain the best depth, I, in 1843, sowed fifteen acres all over with red and yellow clover, and a third part with each of the following grasses in addition, viz.:—Italian eye-grass, Pancy's rye-grass, and Timothy. Two-thirds of the land intended for each of the grasses was rolled after the barley was finished. The grasses and clovers were then sown, and half of the rolled portion was bush-harrowed, the other half, as well as the part not rolled, was covered in with grass-seed harrows. I was surprised at the small apparent difference

of the crop, but, on closer inspection, the shallower sown seemed thicker planted, and the deeper to have stocked more, from being thinner. It was with a view to settle this point that it seemed necessary to count the plants which would grow at each depth. The seeds were treated in the following manner:—Two boxes, five feet ten inches by one foot, were filled with soil; No. 1 to within a quarter of an inch of the top; No. 2 to the top on the one side, regularly sloping to within three inches of the top of the other. They were then divided across by slips of wood two inches broad, so as to leave fourteen spaces of two inches by one foot in each box. The same weight of seed was sown in each box, the slips were removed, and the boxes filled to the top with soil. They were placed in a green-house for the first ten days, to prevent the risk of heavy rains, which would have crusted the surface. This may have caused the seeds to spring from a greater depth than would have happened under ordinary circumstances. The quantities sown, as marked in the first column of grains of sixteen to the drop, were such as each ought to have produced nearly the same number of plants, had the seed continued as good as when sown and counted in spring, with the exception of the Timothy, of which nearly a double number was sown, from the difficulty of distributing so small a quantity equally. A quarter of an inch is too deep for the *Poa nemoralis*, as it grew freely when scarcely covered. The other information to be obtained from the experiment, beyond that for which it was made, is, that it requires double the weight of Italian rye-grass seed to produce the same number of plants that it does of common—that, in this case at least, the clovers and fox-tail seeds, kept over a summer, would have been dear at half price—and that the total of the second column of No. 1 is less than the first column of No. 2. I may also mention that, in a similar experiment tried this spring, 1844, and now growing here, the number of plants appear to diminish in the same proportion as shewn in No. 2. They are generally most vigorous at three-quarters of an inch of depth, with the exception of cock's-foot, rib-grass, and red clover, which do well to an inch and a-half. Whether this difference arises from these depths being most suitable, or from the smaller number of plants, must be ascertained in a future experiment, by thinning them out to a single row. I would recommend all who wish to avoid disappointment, to prove *all* their grass, clover, and turnip seeds before sowing, by sowing a small weight in a pot, and placing it in a warm situation, and counting the plants which come up, and they will find that 28 lb. or 30 lb. of rye-grass seed may be cheaper than 18 lb. or 20 lb., though the price per bushel may be considerably more.

In 1842, when the grass seeds were bad, and not to be procured of average quality, I sowed of some kinds three times the weight per acre which I had found sufficient in ordinary years, and with similar results. As I was much disappointed by following Sinclair's tables of the number of seeds per lb., I subjoin a table of the weight in grains of sixteen to the drop, omitting fractions, which will give 190 plants of each, when the seed of commerce is of the best quality, and which I have found to coincide for the last four years.

9. Meadow Fox-tail.	4. Perennial Rye-grass.
5. Cock's-foot.	9. Italian ditto.
7. Meadow Fescue.	3. Red Clover.
9. Hard Fescue.	4. Yellow Clover.
1. Timothy Grass.	2. White Clover.

If the seed should prove of this quality, I would recommend the following mixture to be sown for permanent *sheep* pasture:—

9 lb.	of	Fox-tail, which will give	1	plant to each	8	square inches	of ground.
2½	..	Cock's-foot, ..	1	..	16	..	..
3½	..	Meadow Fescue, ..	1	..	16	..	..
4½	..	Hard Fescue, ..	1	..	16	..	..
4½	..	Italian Rye-grass,	1	..	16	..	..
3	..	Red Clover, ..	1	..	8	..	..
4	..	Yellow Clover, ..	1	..	8	..	..
4	..	White Clover, ..	1	..	4	..	..
8	..	Timothy, ..	1	..	1	..	..
2	..	Rib-grass.					
1	..	Yarrow.					

Which will altogether give about two plants to the square inch. If the trial of any seed falls short of the number of 190, by any quantity, say an eighth, then 1 lb. must be added to the Timothy, ½ lb. to the yellow and white clover, and so on in proportion. It may be asked why I recommend this mixture in this proportion? I answer that, after repeated trials, I have found this mixture to succeed better than in any other proportion. Why I sow red clover and Italian rye-grass for permanent pasture? Because it is too expensive to seed the land sufficiently for the first year with the grasses which sheep prefer, and because these carry more stock, and I have better pasture the following year. I cannot tell whether this is owing to the quantity of manure which the stock leaves, or to the food for plants conveyed to the soil by the clover, from the atmosphere, or to the fact which I, as well as others, have noted, (Mr Kay of Shiphaugh, Stirling,) viz., that grasses grow best when clover is sown along with them. The Italian rye-grass gives the earliest bite, and helps to occupy the space which would otherwise be filled with daisies and other weeds. Why I sow yellow clover? Because I sowed down a field with grass,

one-half mixed with yellow clover and the other with white, and the sheep preferred that which was sown with yellow. Why I do not sow rye-grass, dog's-tail, vernal, poa trivialis, pratensis, and perennial red clover? Because I sowed these and the others, which I recommend separately, and put on a light stock of sheep early, so that they should not be compelled to eat that which they disliked. The rye-grass will not carry through the stock necessary to keep it down in spring, and both it and the dog's-tail were so much neglected, that I cut a full crop of hay off them. The poa trivialis, vernal, and pratensis, in a year or two, became very unproductive, the two former suffering from drought, and the last forming a mat of which the greater proportion is uneatable, and which chokes everything else. The perennial red clover, which I procured from a most respectable seedsman in Edinburgh, proved the common biennial. I therefore do not choose to pay an additional price, and run the same risk again. Besides, I see it neglected in my old pastures, where it grows naturally. For neat cattle I would recommend rye-grass in addition, and for milch cows that the yarrow be omitted, as I have found it, when in excess, to impart a disagreeable flavour to the butter.

I have the greatest pleasure in expressing my obligations to Messrs Drummond & Sons of Stirling, for their ready assistance in this and all other matters relating to agriculture.

Table of the greatest number of plants I have succeeded in raising, from 1 oz. to 1 lb. of the following seeds during the last four years:—

	oz.	lbs.		oz.	lbs.
Timothy,	49,005	784,080	Perennial Rye-grass,	12,251	196,020
Fox-tail,	5,445	87,120	Italian ditto,	5,445	87,120
Cock's-foot,	9,801	156,816	Red Clover,	16,335	261,360
Meadow Fescue,	5,801	112,011	Yellow ditto,	12,251	196,020
Hard Fescue,	5,445	87,120	White ditto,	24,502	392,040

IMPROVEMENTS ON THE SINGLE-HORSE CART.

By Mr John Dryden, Saunder's Street, Edinburgh.

The writer of this paper having detailed the observations that first led him to adopt the idea of the proposed improvement, which has for its object the relieving of the horse of those inconveniences that attend his travelling up or down hill, arising from the variations in the effects of the load as it presses upon his back; and having failed to meet with anything in practice

that seemed to bear upon the subject, or to have any tendency to the relief of the suffering animal under these circumstances, he thus proceeds :—" It occurred to me that a *moving* balance would be a good improvement, to meet all the ups and downs of the roads, and then by it the back weight could be reduced or taken off altogether, in going over the sloping and level parts of the road. I had also satisfied myself as to the ease and simplicity with which such a movement could be made, and also of its apparent usefulness.

" Of all the agricultural implements on which improvement has been made, for the purpose of softening animal labour, there are none wherein *less* has been shewn or tried than the single-horse cart, under the impression, I presume, that its capabilities had been exhausted, and that no other improvement could be made beyond what proceeded from the axle, bushes, and angle of draught.

" With these considerations in view, I had a model of a cart constructed as now submitted, shewing the balance-regulating screw, and the effect of its operation; but before speaking of this improvement, it may be proper to advert to the single-horse cart in its present state, and examine how far it is adapted in its balancing to assist the horse in working the different rises and falls of the road.

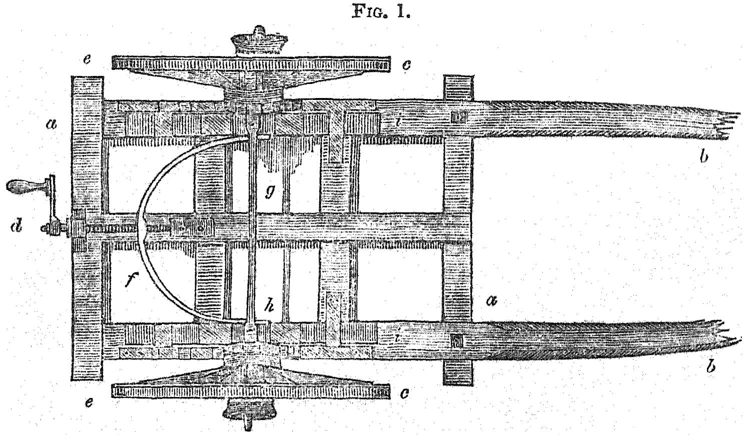
" At present there is one general rule, or nearly so, for disposing of the load in this very effective machine. It consists in dividing the body of the cart into seven equal parts, and in placing the body on the axle, with three of these parts behind and four parts before the axle, so that there is always an unalterable seventh part of the whole load resting on the horse's back. This seems to be all that has been thought of in the disposing of this matter, and, I believe, is the only mechanical means that we are in possession of for assisting and economizing animal labour in working the single-horse cart. It is admitted that a fixed balance assists the horse in working the ascending parts of the road; but, suppose that the cart is upon a level or on a declining part of the road, the back-weight becomes no longer useful, but oppressive. There is no remedy, as things at present stand, but the poor animal must go on, bearing a weight, for hours together, that he should in a great measure, if not altogether, be relieved from.

" Having thus pointed out the defects of a fixed balance, I proceed to shew the way by which the cart will be improved; and this is done by means of the balance-regulating screw—(See Figs. 1 and 2)—which moves the body of the cart to suit the different workings of the road. Thus, suppose a cart loaded in the common way, with a seventh part of the load resting on the horse's back, but there being level, declining, and

ascending parts of the road before us, the use of the balance-regulating screw is at once evident; because, by turning it, the unnecessary load on the back, in descending, is transferred from the back of the horse to the axle, where it remains until it is again wanted at a level or at an ascending reach, when the whole, or any part, can at any time be brought to bear at the proper point that the road may require. The horse has never yet benefited by the improvements on roads to their fullest extent, nor can he be so while the back-weight continues to oppress him. Remove it, by throwing the same upon the axle when not useful, and then he will move along the level and declining parts of the road with nothing, comparatively speaking, but the weight of the harness on his back, and when called upon to take the ascending reaches of the road he will come to his work fresh and prepared for it.

"The figures shew also a new and easy method of checking the onward pressure, and, at the same time, removing the greater part of the weight from the back of the horse where the declivity is very steep, so that the poor animal is almost completely relieved from these two acts of oppression that he has hitherto been compelled to suffer while working on the steep declivities of roads; *also* a simple method for preventing the wheels from running back in going up the steepest acclivities, so that the cart can be stopped and the horse rested, just by standing still, the same as if the cart was on the level road."

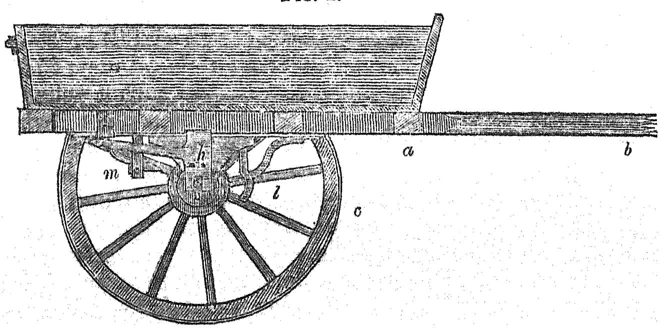
Fig. 1.



Figs. 1 and 2 represent the model cart of Mr Dryden with the improvements proposed by him, Fig. 1 being a plan of the cart with its bottom upward, in order to shew more clearly the arrangement of the parts; *a a* is the body of the cart, the shafts

being broken off at *b b*; and *c c* are the wheels. The balance-regulating screw, *d*, is attached to the hind cross head, *e e*, of the cart body, and so prevented changing its position by means of two collars or ruffs, while the screwed part enters the iron bow, *f*, which, by its forming the nut of the screw, the bow is drawn backward or forward by turning the screw; or, if the bow is attached to any fixed object, the screw, and whatever it is attached to, will be moved towards or from the bow. In the arrangement here described, the bow is firmly attached to the axle, *g*, of the cart and to the bolsters, *h*, which are fixed to the axle, while the latter is placed in connexion with the cart body by means of the two iron slide bars, *i*, the connexion being effected by iron clasps fixed to the body of the cart, and which allow the body to move freely on the slides. When the cart, thus equipt, is placed in its natural position on the wheels, its movements forward or backward upon the bolsters and axle are effected by turning the screw to right or left by the handle, *d*.

Fig. 2.



The apparatus also alluded to for retarding or dragging, and for checking the return of the wheels in surmounting acclivities, is represented more distinctly in Fig. 2, which is a longitudinal section of the same cart, in which the parts already described are marked by the same letters as in Fig. 1. In this figure, *l* marks a lever or puppet attached to the cart body, which, as the cart is moved backward upon the bolster and axle, for making a descent, is brought into contact with the nave of the wheel, and thus acts as a friction-strap or drag while the cart is descending. On the other hand, if a steep ascent is to be overcome, the cart body is thrown forward upon the axle, by means of the screw, until the pall, which is jointed to the puppet, *m*, comes into contact with the ratchet formed on the nave of the wheel, and thus, as the wheel advances, the pall falls into the successive notches,

and so prevents any recoil even though the horse ceases to pull.

Note by Mr Slight.—In the foregoing paper the author very correctly states the proportions of the load in a single-horse cart, that lie before and behind the axle—one seventh part of the cart body or load—and the reader is left to infer that the horse has to bear upon his back, through the medium of the back chain, this one-seventh part of the whole load, which, in ordinary cases, would amount to from four to five cwt.—a load greatly beyond what a horse is able to work under. There is, fortunately, an error in this conclusion, which the author seems to have overlooked, and this arises from his not taking into account that the shafts through which the horse bears up this heavy load, form a lever by which he sustains it with a mechanical advantage, in the proportion of 4.5 to 1, thereby reducing, as I have shewn in the "Book of the Farm,"* the actual strain upon his back to an average of 120 lb. with a full load on a level road; and in the same work it will be seen that in undulating roads the increase of pressure on the horse's back will not, in any practical case of ascent, exceed 140 or 150 lb.—similar to the weight of an ordinary man placed upon his back. It must always be borne in mind, too, that in such a yoke as the cart, the horse acts with greater advantage in pulling when he is moderately loaded on the back. As regards the proposed mode of retarding or *dragging* on declivities, it may be remarked that, in most cases of friction applied to the nave of the wheel for this purpose, the experiments have been failures, owing to the small amount of leverage in favour of the friction-strap or block when applied so near the axle. The French practice, now so successfully extending, of applying the friction to the periphery of the wheel, will always be much more effective.

The pall and ratchet proposed by the author seem to promise more effective and useful results than those of the proposed drag, and might form a useful appendage to all carts.

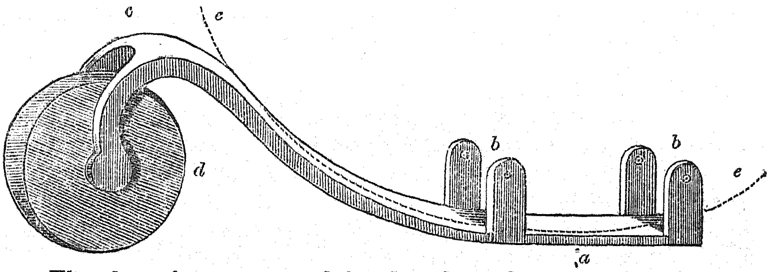
NOTICE OF A WELSH WHEEL-DRAG.

Presented to the Society's Museum by L. Macquarie of Macquarie, Esq.

This wheel-drag, which attracted Captain Macquarie's attention when lately travelling in Wales, seemed so effective, that a

* Book of the Farm, vol. iii., p. 1183.

full-sized one was ordered on the spot, and has been presented to the Society's Museum.



The drag is represented in the above figure, and consists of a sole or shoe, *a*, resembling in part the common shoe-drag, with two pairs of ears, *b b*, standing up from the sole, between which the wheel is received. From this part or body of the instrument there is prolonged a swan-neck which is forked at the extremity, *c*, to receive a small wheel or roller, *d*, about nine inches diameter, and two and a-half inches broad on the rim, turning upon an axle. The swan-neck is formed to suit the curvature of the cart or waggon-wheel, represented by the dotted arc, *e e*, and is supported upon the roller, while the cart-wheel rests lightly upon the neck, and the principal share of the weight falls on the body or level part between the pairs of ears. This arrangement requires no chain as with the common drag; for the wheel being prevented running over the drag by the rise of the neck, while that is supported and borne up by the roller, the wheel is thus placed in a distinct carriage, and hence the advantages arise. With the common drag, the chain is a necessary appendage required to keep the shoe under the wheel; and from its being attached to the body or shaft of the carriage, and the rough unequal motion of the shoe rendered still more so from that connection, being thus communicated through the chain, an uneasy tugging and vibratory motion is produced upon the carriage and imposed upon the horse. With this *truck-drag*, as it may be named, the above-mentioned effects upon the horse are avoided, and, as has been observed from the experiments with the drag now described, considerable relief seems to be afforded to the horse. The experiments were made on a cart loaded with twenty-two cwt. of coal, descending an inclination of road falling at the rate of one in eight. Without any drag the horse seemed much oppressed in resisting the descent of the cart; but, when the truck-drag was applied, he moved along apparently with the same ease as if the cart had been upon a level road, and the usual unequal motion produced by the shoe was entirely absent; but, in order

to contrast the two, the common shoe-drag was next appended, and upon the same piece of road. The difference of effect was here very decided, the shoe producing the tugging and unequal effects upon the horse already alluded to, making him swerve right and left from the direct course, and seemed to give him very considerable annoyance and fatigue beyond what he experienced from the other.

In hilly districts, where a drag becomes necessary, and, under such circumstances, if the proprietor has a due regard for the ease and comfort of his horses, he will find advantage from the use of this instrument. In its adaptation to carts or other carriages, it is not necessary that it be attached to a strong chain, and so appended to a particular part of the vehicle, like the common shoe-drag. It may, on the contrary, be appended at any convenient point, by an attachment only sufficient to carry its own weight, or it may be laid up in any convenient part of the cart or carriage until it is required.

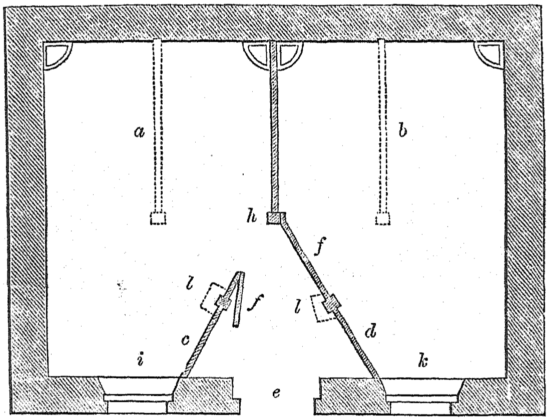
ECONOMICAL PLAN FOR CONVERTING A STABLE INTO LOOSE-BOXES.

By Mr R. Ballingal, Kingsdale, Fifeshire.

The management of stock has been the subject of earnest inquiry by the Scotch agriculturist, and much valuable information has been submitted to the public by Professor Dick and others, upon the most approved method of preparing food and feeding of horses. It is, however, to be regretted that with very few exceptions in the erection of farm buildings, no accommodation is thought necessary or provided for the accidental or casual disease of farm horses. The following plan is therefore submitted with a view of turning the attention of both landlord and tenant to the subject when they erect or repair their stables.

Let the accompanying figure represent a stable fitted up with four stalls. To convert it into a couple of convenient loose-boxes, it is only necessary to remove the intermediate travises, *a* and *b*, represented by the dotted lines, and to erect a boarding, *c* and *d*, on each side of the stable door, *e*, and upon these boards to hang the doors, *f f*, one of which is represented open, and the other closed against the travis post, *h*. The windows, *i* and *k*, give light to the boxes respectively. The whole arrangement is so distinct that no farther description of it seems necessary; the only remark requisite is to explain that, by making the travises, *a* and *b*, and the boarding, *c* and *d*, with their doors, movable,

the stable could be converted into a loose-box in a few minutes, and the loose-boxes transposed again into a stable at pleasure.



It requires no argument to point out the beneficial result of putting a diseased or lame horse speedily into a loose-box. Therefore, if this can be obtained by a better arrangement within the same dimensions of stable, at an expense of a few boards, bolts, and sockets, such as at *l l*, no person possessed of a stock of horses should be without one or more of them, if possible, to facilitate the cure of a valuable animal, the full benefit of which can only be appreciated by those who have lost horses by being cramped and confined into an ordinary stall, instead of having freedom of movement in a loose-box.

LEICESTER WOOL COMPETITION FOR 1844.

Remarks prefatory to Tabular Statement.

The competition for the Premiums offered by the Highland and Agricultural Society of Scotland, with a view to the improvement of the growth and management of Leicester wool in Scotland, took place at the Society's Museum, Edinburgh, on the 31st day of July, and on the 1st and 2d days of August last, under the superintendence of a committee, appointed by the Board of Directors, consisting of the following gentlemen, viz.:—

Mr Hog of Newliston.
Mr Baillie of Coulterallers.
Mr Boyle, younger of Shewalton.
Dr Macdonald, M.D.
Mr Whyte of Glenesslin.
Mr Stephens, Redbrae Cottage; and
Mr Dalzell, Whitehouse, Chairman.

Impressed with the importance of the objects of the competition, the Directors deemed it to be incumbent upon them to avail themselves, though at considerable expense to the Society, of the best attainable aid in the performance of the delicate and responsible duty of appreciating the merits of the fleeces which should be exhibited; and, accordingly, they solicited and obtained the services, as judges, of Mr Pedley of Gloucester and of Mr Barff of Wakefield, two gentlemen of high respectability, and extensive knowledge as wool-staplers, in England, in addition to Mr Archbald, a respectable wool-stapler at Alloa.

The number of fleeces which were found, under the "Rules of Competition," to be admissible to compete, was forty; and it was satisfactory that, in every case, there was a sufficient number of competitors to authorize the adjudication of the full amount of the specified premium.

The awards of the judges, as approved by the Directors, and the names of the competitors in whose favour they were made, with descriptions of the systems pursued in the management of the flocks from which the prize fleeces were taken, are inserted, along with other interesting particulars, in the Tabular Statement hereto appended.

The criteria by which it was required that the merits of the fleeces in the first four Classes should be determined, were the fineness, trueness, soundness, softness, and elasticity of the fibre, combined with proper length of staple; and in the fifth Class

the rule of judgment embraced both the quality and weight of the wool. The competition was restricted to fleeces of shearling tups and ewes, or sheep the produce of 1843; and from the structure of the Classes, the lightest fleeces exhibited were shewn in Class I. and the heaviest in Class IV. In the former, the tup fleece of least weight weighed 5 lbs. $4\frac{3}{4}$ ounces, and the corresponding ewe fleece, 5 lbs. $\frac{1}{2}$ ounce; while, in the latter, the tup fleece of greatest weight weighed 9 lbs. 9 oz., and the ewe fleece, 8 lbs. 10 oz. In Class V., which comprehended the winning fleeces only in the previous classes, and in which, as just stated, the grounds of preference were the quality and weight of the wool united, the ewe fleece to which the premium was adjudged weighed 6 lbs. $8\frac{3}{4}$ oz., and the tup fleece only 5 lbs. $8\frac{1}{4}$ oz. The number of tup fleeces exhibited in the different classes was seventeen, and, on average, they weighed 7 lbs. $12\frac{5}{8}$ oz. per fleece. The ewe fleeces amounted to twenty-three; and the average weight of them was, in like manner, 6 lbs. $14\frac{3}{4}$ oz. So far, therefore, as the results of the competition may be considered to furnish data on which to form an opinion, it would appear that, as concerns the wool, independently of the carcass of the sheep, the production of a fleece of moderate weight and superior quality is more an object of desirable pursuit than the acquisition of a heavier fleece of inferior quality.

Among the premiums offered by the Society for Essays and Reports in the present year, there is one relating to the washing of sheep, having for its design to elicit suggestions of useful improvements in that department of the economy of flocks, and of the means most suitable to facilitate their introduction into practice; and, in advertence to observations which were submitted by Messrs Pedley and Barff at the competition, in allusion to the defective mode (alleged to be too prevalent in Scotland) wherein fleeces are managed, as regards the removal from them of clotted locks and other injured portions, the Directors feel it to be their duty, on this occasion, earnestly to invite the attention of wool-growers, throughout the country, to this most essential point in the getting up of fleeces. It is in this respect that importance chiefly attaches to the process of winding, the special end of which is far less the orderly folding of fleeces than security for the abstraction from them of injurious adjuncts and imperfect wool, which diminish their worth to the manufacturer, and prevent their rising to that place in the estimation of wool-buyers which is requisite to insure the realization, by the growers, of the full value of the wool.

It is, however, gratifying to add that, among the fleeces exhibited at the competition, there were, nevertheless, highly creditable specimens of careful and successful management.

STATEMENT of the PREMIUMS for Improving the GROWTH and MANAGEMENT of LEICESTER WOOL in SCOTLAND, awarded at the COMPETITION held at EDINBURGH in the Year 1844.

Classes and Specifications of Premiums.	Competitors' Mottoes or Marks.	Weights of Fleeces. Tup. lbs. oz.	Weights of Fleeces. Ewe. lbs. oz.	Number of Competitors.	Awards of Judges.	Names and Addresses of Competitors in whose favour Awards were made.	Particulars of the Flocks from which the Prize Fleeces were taken. Number of Sheep.	Time of Clipping.	Average weight of Quarter of Two-Years'-Old Wether.	Proportion, in Quality and Weight, of Average Fleeces to Specimens.	Systems of Management.
CLASS I. 1. For the best Fleece, without reference to weight, clipped from a Shearling Tup in 1844—Five Sovereigns.	Order.	5 $8\frac{1}{4}$		6	5 Sovereigns.	Mr G. Brown, Halls, Dunbar.	Keeping lot of about 50 Tup Hoggs.	About 15th May.	28 to 30 lbs.	Specimen below the average in weight.	*Mr Brown's System.* The lambs are weaned about the 18th of July, and put to grass; and, about the middle of November, they are bathed with a mixture of tobacco liquor and spirit of tar, in the proportion of half a pint of the former to a wine glassful of the latter, carefully mixed, for each sheep. They are put on turnips about a week later; and during winter, and till about the beginning of March, they are allowed a full supply of turnips, laid on pasture. Afterwards half a pound of oil-cake for each is added to the turnips.
2. For the best Fleece, without reference to weight, clipped from a Shearling Ewe in 1844—Five Sovereigns.	B.		5 3	7	5 Sovereigns.	Earl of Mansfield, Scone, Perth.	200 Ewes.	12th June.	19 lbs. at 20 months old.	The average weight of the Ewe Hogg fleeces is about 5 lbs., and of the Tup Hogg fleeces, about $7\frac{1}{2}$ lbs.	*Lord Mansfield's System, from the account of his Lordship's Factor, Mr Geekie.* After the ewes have been carefully bathed with "Wilson's Improved Bath," which is generally done in the last week of October, they are put on good fresh pasture for two weeks; and about the 6th of November the best ewes, as regards figure and quality of wool, being selected from the flock, the choice tups, or those possessing similar qualifications, are allowed access to them, in the proportion of one tup to forty or fifty ewes. At the end of twenty days, the tups are withdrawn from the first class ewes and put to those of the second class, and the tups which have been with the second class ewes are transferred to those of the first class; so that, if any of the ewes should not have held to the tups of their

Classes and Specifications of Premiums.	Competitors' Mottoes or Marks.	Weights of Fleeces. Tup.	Weights of Fleeces. Ewe.	Number of Competitors.	Awards o Judges.	Names and Addresses of Competitors in whose favour Awards were made.	Particulars of the Flocks from which the Prize Fleeces were taken. Number of Sheep.	Time of Clipping.	Average weight of Quarter of Two-Years'-Old Wether.	Proportion, in Quality and Weight, of Average Fleeces to Specimens.	Systems of Management.
		lbs. oz.	lbs. oz.								
CLASS I. 2. For the best Fleece, without reference to weight, clipped from a Shearling Ewe in 1844—Five Sovereigns. (*Continued.*)	B.		5 3	7	5 Sovereigns.	Earl of Mansfield, Scone, Perth.	200 Ewes.	12th June.	19 lbs. at 20 months old.	The average weight of the Ewe Hogg fleece is about 5 lbs., and of the Tup Hogg fleece, about $7\frac{1}{2}$ lbs.	respective classes, they may have the service of a different tup. When forty days have elapsed, the tups are withdrawn altogether. As the first class ewes are served, the shepherd makes a memorandum of the service in a book kept for the purpose, and the ewe lambs of this class are reared and taken into the stock at the age of sixteen months, to supply the places of the ewes which have been drafted for sale. The ewes are allowed to feed on the pastures till about the end of January, when, if the winter is severe, they are put on turnips for six weeks, and, if mild, for a shorter period. About the middle of March they are turned into the pastures where they are to lamb, sheds being provided for protection from the weather of the newly dropped lambs and their dams. In the first week in June, if the weather is favourable, the ewes are washed in a stream of pure water. The process is performed by five men, who stand in the stream in a slanting direction, so as to permit the dirty water proceeding from those in the upper portion of the line to flow free of those below. The sheep to be washed is first put into the hands of the person lowest in the stream, and when he has done with it, he passes it to the next above him, and so on until it reaches the shepherd, who is generally stationed at the top of the stream, to see that all parties perform their duty, and that the sheep is properly washed. The washing of the whole having been accomplished, the sheep are turned into clean old pasture, clear of sand pits and other sources of discoloration and incumbrance to the wool, and, after eight days, they are clipped—a longer period than ten days never being allowed to intervene between the washing and clipping. The ewes clip from four to five and a-half lbs. of wool each. The lambs are taken from the ewes and

weaned about the middle of July; and after the milk is fairly off the ewes, the oldest and coarsest of them are drafted, and removed to better pasture to fatten for the butcher; and they are generally sold about the end of September, when they will average, in weight, about $17\frac{1}{2}$ lbs. per quarter.

Ewe lambs or hoggs are put on turnips about the middle of December, and kept on them till the end of March, when those intended for the butcher are put on good early pasture, and those designed for stock are put on pasture of second quality. They are washed about the middle of May, and they receive the same treatment as the ewes at washing and afterwards. They will clip about $5\frac{1}{4}$ lbs. of wool on an average. About the middle of July a second draft is made from those which had been set aside for stock, when the coarsest, as to shape and wool, are taken out and put on better pasture to fatten. Those selected for stock now change their name to gimmers, and being united to the stock ewes, the whole are afterwards treated alike.

Wether and tup lambs or hoggs, when weaned, are removed to clover foggage, where they remain till the last week of October. They are then put on turnips with hay or straw, and thus continued until the 1st of May, when they are removed to the best pasture. They are washed and clipped at the same time as the ewe hoggs. The wether hoggs yield, on an average, about $5\frac{3}{4}$ lbs. of wool, and the tup hoggs about $7\frac{1}{2}$ lbs. The wethers are sold about the end of June or beginning of July, when they will weigh, on an average, about 15 lbs. per quarter. The ewe and wether lambs are bathed with "Wilson's Improved Bath" about the middle of September. The same is done with the tups, when they are taken from the ewes in December, after which they are put on turnips with the wether hoggs to make up their condition.

No Leicester wethers have been kept to the age of two years for a considerable period; but last year there were some which had been retained for twenty months, when they averaged in weight 19 lbs. per quarter, and brought a price of 38s. each in Smithfield market.

Classes and Specifications of Premiums.	Competitors' Mottoes or Marks.	Weights of Fleeces. Tup.	Weights of Fleeces. Ewe.	Number of Competitors.	Awards of Judges.	Names and Addresses of Competitors in whose favour Awards were made.	Particulars of the Flocks from which the Prize Fleeces were taken. Number of Sheep.	Time of Clipping	Average weight of Quarter of Two-Years'-Old Wether.	Proportion, in Quality and Weight, of Average Fleeces to Specimens.	Systems of Management.
		lbs. oz	lbs. oz.								
CLASS I. 2. For the best Fleece, without reference to weight, clipped from a Shearling Ewe in 1844—Five Sovereigns. (*Continued.*)	Cocksfoot.		6 0		Silver Medal	R. Graham, Esq. of Balgowan, Perth.	140 Ewes.	27th May.	Not above 22 lbs.	The average weight of the Shearling Ewe fleece is about 6½ lbs., and of the Shearling Tup fleece, about 1 lb. more. In quality, the wool of the flock is probably equal to the specimen.	*Mr Graham's System.* Mr Graham has only paid particular attention to the flock of Leicester sheep at Lyndoch since about the year 1832; but the stock had been there previously for more than twenty years. His object has been to keep the breed perfectly pure; and, by judicious selection, to improve it in form, and in the quality of the wool. Size has not been so much aimed at as purity of breed and symmetry of shape, combined with goodness of constitution. The quality of mutton, however, has not been disregarded, and the lambs are considered to afford food of as delicate and agreeable a kind as is to be found in any other breed. In 1832 the number of ewes was 120; and as, in drafting the ewes, the gimmers, and the lambs, none were rejected except those which, on rigid examination, were found faulty, or very inferior in size or shape, the ewes, in the autumn of 1843, had increased to 160; which, including lambs, gimmers, and wethers coming on under the system pursued at Lyndoch, might be estimated as equal to a flock of 400 sheep. This was thought to be rather too large a proportion of sheep upon the winter provisions, in relation to the other stock on the farm; and about lambing time, in the spring of the present year, 80 ewes were sold, leaving 80 in the flock; and as the gimmers of the current year exceed the average number, being 60, the number of ewes, it is expected, will be augmented to 140 in October. The general practice is to sell no lambs except those which are reckoned faulty or undersized, when, in the month of October, their qualities may be held to be fairly developed. A large proportion—probably two-thirds—of the tup lambs are kept as rams, to allow a good selection

											to be made for service in the flock, and to leave a supply for the demands on the estate, and in the neighbourhood; and, as fancy prices are not looked for, there is no great difficulty in disposing of those which can be spared, generally at something above the butcher's price. The barren ewes and Dinmonts are sold as soon after the clip as a market can be procured, and the cast ewes as soon as they can be brought into a condition fit for sale. A satisfactory test of the general value of the wool, is afforded by the fact that it was one of three parcels which brought the highest price, or 29s. per stone of 24 lbs. at Perth; and also from the circumstance that, if the specimen for which the Silver Medal was assigned in Class I. 2, had been eligible to compete in Class V. 10, the Gold Medal would have been awarded for it.
CLASS II. 3. For the best Fleece, weighing not less than 7 lbs. nor more than 8 lbs., clipped from a Shearling Tup in 1844—Five Sovereigns.	Merit.	7 0¼		3	5 Sovereigns.	Mr G. Brown, Halls, Dunbar.	Keeping lot of about 50 Tup Hoggs.	About 15th May.	28 to 30 lbs.	Average fleeces equal to specimen in quality and weight.	Vide Class I.—1.
	Ex Industria.	7 0½			Silver Medal.	Mr W. Mylne, Bolton, Haddington.	7½ score of Shearling Rams and Gimmers.	About 24th May.	Two shear Ram, estimated at 40 lbs. per qr. without extra feeding.	Generally, fleeces of Shearling Rams weigh from 8 to 10 lbs., and of Gimmers from 6 to 8 lbs.	*Mr Mylne's System.* For some years there have been from 6 to 7 score of ewes in the flock, and the usual practice is to take the lambs from the dams about the middle of July, and put them to grass until the middle of November. Thence till the middle of April, they have full feeding upon turnips at home or elsewhere; and then they are again put on grass. Eight or ten days before being clipped they are washed in a running stream; and, at this season, the ewes which are considered superior are selected for breeding, and the rest sold as fat sheep. The rams are generally kept till autumn, when they are let to breeders, or sold for crossing with hill stock.
4. For the best Fleece, weighing not less than 6 lbs. nor more than 7 lbs., clipped from a Shearling Ewe in 1844—Five Sovereigns.	Veronica.		6 8¾	6	5 Sovereigns.	Mr T. Simson, Blainslie, Lauder.	About 20 score.	6th June.	Fully 22 lbs., fed on grass and turnips.	The whole clip, in weight and quality, corresponds with specimen.	*Mr Simson's System.* The ewes generally begin to lamb about the 20th of March, when the twins are put upon young grass, and the single lambs upon two-years'-old pasture; some turnips being allowed, if any are available, and the season is backward. The lambs are commonly weaned about the middle of July; and those intended for breeding (from

Classes and Specifications of Premiums.	Competitors' Mottoes or Marks.	Weights of Fleeces. Tup.	Weights of Fleeces. Ewe.	Number of Competitors.	Awards of Judges.	Names and Addresses of Competitors in whose favour Awards were made.	Particulars of the Flocks from which the Prize Fleeces were taken. Number of Sheep.	Time of Clipping	Average weight of Quarter of Two-Years'-Old Wether.	Proportion, in Quality and Weight, of Average Fleeces to Specimens.	Systems of Management.
		lbs. oz	lbs. oz.								
CLASS II. 4. For the best Fleece, weighing not less than 6 lbs. nor more than 7 lbs. clipped from a Shearling Ewe in 1844—Five Sovereigns. (*Continued.*)	Veronica.		6 $8\frac{3}{4}$	6	5 Sovereigns.	Mr T. Simson Blainslie, Lauder.	About 20 score.	6th June.	Fully 22 lbs., fed on grass and turnips.	The whole clip, in weight and quality, corresponds with specimen.	one of which the specimen fleece was taken) are kept on such pasture as can be spared, the best being reserved for the cast ewes. In October, they are bathed with a mixture consisting of tobacco juice, black soap, and spirit of tar; and about the end of November they are folded upon turnips, with an allowance of hay, and thus kept till about the middle of April, when they are put upon old pasture. In general, if the weather permit, they are clipped about the 6th of June, and kept on the same old pasture until about the beginning of October, when they undergo the like process of bathing as in the previous year. The ewes are then supplied with turnips for about a fortnight before the rams are put to them, and also while they are with them. The rams bred in the flock are used when it can be done without too great nearness of kin; and those purchased are obtained from Mr Lynn, Mr Compton, Mr Smith, Lord Polwarth, and other eminent breeders. When the ewes are removed from the rams, they are again put upon grass alone until the month of February, when they get a few turnips once a day till within a fortnight of lambing, and then they have full allowance.
Ditto.	Ex Industria.		6 $7\frac{1}{2}$		Silver Medal.	Mr W. Mylne, Bolton, Haddington.	$7\frac{1}{2}$ score of Shearling Rams and Gimmers.	About 24th May.	Two shear Ram, estimated at 40 lbs. per qr. without extra feeding.	Generally, fleeces of Shearling Rams weigh from 8 to 10 lbs., and of Gimmers from 6 to 8 lbs.	Vide Class II.—3.

CLASS III. 5. For the best Fleece, weighing not less than 8 lbs. nor more than 9 lbs., clipped from a Shearling Tup in 1844—Five Sovereigns.	Obtain.	8 $3\frac{1}{2}$		4	5 Sovereigns.	Mr G. Brown, Halls, Dunbar.	Keeping lot of about 50 Tup Hoggs.	About 15th May.	28 to 30 lbs.	Average fleeces are equal to specimen in quality and weight.	Vide Class I.—1.
	Ex Industria.	8 $11\frac{1}{2}$			Silver Medal.	Mr W. Mylne, Bolton, Haddington.	$7\frac{1}{2}$ score of Shearling Rams & Gimmers.	About 24th May.	Two shear Ram, estimated at 40 lbs. per qr. without extra feeding.	Generally, fleeces of Shearling Rams weigh from 8 to 10 lbs., and of Gimmers from 6 to 8 lbs.	Vide Class II.—3.
6. For the best Fleece, weighing not less than 7 lbs. nor more than 8 lbs., clipped from a Shearling Ewe in 1844—Five Sovs.	Silver.		7 $8\frac{1}{4}$	5	5 Sovereigns.	Mr G. Brown, Halls, Dunbar.	Keeping lot of about 200 Ewe Hoggs.	About 15th May.	28 to 30 lbs.	Average fleeces are equal to specimen.	Vide Class I.—1.
CLASS IV. 7. For the best Fleece, weighing not less than 9 lbs., clipped from a Shearling Tup in 1844 — Five Sovereigns.	XLII.	9 9		4	5 Sovereigns.	Mr G. Brown, Halls, Dunbar.	Keeping lot of about 50 Tup Hoggs.	About 15th May.	28 to 30 lbs.	The specimen is above the average fleeces of the flock in weight.	Vide Class I.—1.
8. For the best Fleece, weighing not less than 8 lbs., clipped from a Shearling Ewe in 1844 — Five Sovereigns.	Ex Industria.		8 2	5	5 Sovereigns.	Mr W. Mylne, Bolton, Haddington.	$7\frac{1}{2}$ score of Shearling Rams and Gimmers.	About 24th May.	Two shear Ram, estimated at 40 lbs. per qr. without extra feeding.	Generally, fleeces of Shearling Rams weigh from 8 to 10 lbs., and of Gimmers from 6 to 8 lbs.	Vide Class II.—3.

Statement of Premiums—(*continued.*)

Classes and Specifications of Premiums.	Competitors' Mottoes or Marks.	Weights of Fleeces. Tup.		Weights of Fleeces. Ewe.		Number of Competitors.	Awards of Judges.	Names and Addresses of Competitors in whose favour Awards were made.	Particulars of the Flocks from which the Prize Fleeces were taken. Number of Sheep.	Time of Clipping	Average weight of Quarter of Two-Years'-Old Wether.	Proportion, in Quality and Weight, of Average Fleeces to Specimens.	Systems of Management.
		lbs.	oz.	lbs.	oz.								
CLASS V. On a comparison of the winning Fleeces in the four previous classes, and judging relatively of their merits, both as to quality and weight.													
9. For the Tup Fleece, which is considered, on the whole, as possessing the greatest merit — The Gold Medal, or Ten Sovereigns.	Order.	5	$8\frac{1}{4}$				Gold Medal or Ten Sovereigns.	Mr G. Brown, Halls, Dunbar.					
10. For the Ewe Fleece of greatest merit, under the same rule of judging—The Gold Medal, or Ten Sovereigns.	Veronica.			6	$8\frac{3}{4}$		Gold Medal or Ten Sovereigns.	Mr T. Simson, Blainslie, Lauder.					

CLASS VI. 11. For the Fleece of any Class among the unsuccessfulfleeces which is considered to have most merit from its condition as to *washing and winding* —Five Sovereigns.	Cocksfoot.				5 Sovereigns.	R. Graham, Esq. of Balgowan, Perth.					
CLASS VII. 12. For the Fleece among the remaining Fleeces which possesses most merit on the score of *washing* alone — Five Sovereigns.	W.				5 Sovereigns.	Mr G. Brown, Halls, Dunbar.					
	M.				Silver Medal.	Earl of Mansfield, Scone, Perth.					

J. A. DALZELL,
Chairman of the Committee of Superintendence.

By Order of the Directors,
CHARLES GORDON, *Secretary.*

REPORT OF EXPERIMENTS WITH SPECIAL MANURES IN 1843.

By Mr John Dickson, Saughton Mains, near Edinburgh.

[Premium Seven Sovereigns.]

In making the following experiments, I always selected the portion from each field which I considered the most equal in quality of soil, and clear of trees, fences, or any other thing which might affect one part of the crop more than another. I had the portions to be experimented on measured and marked off before applying the special manures; and the whole process, from the distributing of the manures to the measuring and weighing of the produce, was done under my own personal inspection, so that I can vouch for the accuracy of the results.

The farm on which the following experiments were tried is situated about 200 feet above the level of the sea, and distant from it about four miles, in a favourable district of the country, with a southern exposure.

In making the following trials, I did not fix on a given sum, and give to each portion such quantity of each of the manures as such sum would allow; but, judging from the accounts of experiments published by Professor Johnston and others, as well as from my own experience in former years, I selected such quantities of each of the specific manures as I conceived would afford the most profitable result.

I.—Experiment shewing the effect upon *Oats* sown down with grass seeds, of *Saltpetre*, *Salt*, and *Nitrate of Soda* and *Salt* mixed.

The soil in this field is a light loam on a mixed subsoil, but sufficiently porous to have been thoroughly drained in the autumn of 1839, with stone drains 30 inches in depth, and 32 feet apart. Crop in 1840 potatoes; in 1841 wheat; in 1842 turnips. The oats, of the early Angus variety, were sown on the 20th March with the drill machine, across the ridges, at the rate of 4 bushels per imperial acre, and sown down with 10 lbs. red and 2 lbs. white clover, and 3 pecks of rye-grass seeds per imperial acre. The quantity in each portion measured off was a quarter of an imperial acre, and the following special manures were applied on the 10th of May, when the braird was looking well, the weather at the time being showery:—

No. 1, sown with	42 lbs. Saltpetre, at a cost of	L.0	8	3
2,	—	42 lbs. Common Salt, ...	0	1	1½
3,	—	21 lbs. Nitrate of Soda and 21 lbs. Common Salt mixed, ...	0	4	8¼
4,	—	Nothing.			

On the 20th June I examined them minutely, and found then—No. 1 much superior to all the others, broader in the leaf, darker in colour, and considerably taller, the young grass and clovers also more luxuriant. No. 2 inferior to all the others, even No. 4, pale in the colour, stinted, and scorched looking; the rye-grass and clovers also appearing less healthy. No. 3 inferior to No. 1, but considerably better than either No. 2 or 4. I could distinguish no difference between the young grass and clovers of Nos. 3 and 4.

On the 11th of July I found Nos. 1 and 3 equally good, much taller than either Nos. 2 or 4; no difference between the rye-grass and clovers of Nos. 1 and 3. No. 2 now looking decidedly better than No. 4, and appeared firmer in the straw than any of the others; no difference in the appearance of the rye-grass and clovers. I cut the whole on the 2d September, and found then—No. 1 very much laid down, and a good many after-growths, the young grass and clovers partially rotted for want of air; but wherever the oats were not over-luxuriant, the young grass and clovers were very healthy and well planted. No. 2, a fair standing crop, and the grass and clovers looking well. No. 3, a heavy crop, considerably laid down, but not so close to the ground as No. 1, and the young grass and clovers regular and healthy looking. No. 4, a fair standing crop, but not so heavy as even No. 2; the grass and clovers also looking well.

On the 11th September I had the whole carted home and thrashed. I weighed each of the portions in gross before it was put into the barn, from which I afterwards deducted the weight of the grain, which gave me the weight of the straw and chaff; and assuming the prices of oats and straw as those I received at the time in the Edinburgh market, the following is a state of the value and produce of each portion:—

No. 1 produced 16 bushels 12 lbs. of good oats, weighing 42¼ lb. per bushel, at 2s. 8¼d. per bushel,	L.2	3	9
6 stones 8 lbs. of light oats, at 8d. per stone,	0	4	4½
139 stones 4 lbs. of straw and chaff, at 3½d. per stone,	2	0	7½
	L.4	8	9

No. 2 produced 17 bushels 30 lbs. of good oats, weighing 43¾ lbs. per bushel at 2s. 9¾d. per bushel,	L.2	9	6¾
3 stones 12 lbs. of light oats, at 8d. per stone,	0	2	6¾
119 stones of straw and chaff, at 3½d. per stone,	1	14	11½
	L.4	7	1

No. 3 produced 18 bushels 35 lbs. of good oats, weighing 42½ lbs. per bushel, at 2s. 8½d. per bushel,	L.2	11	0
4 stones 4 lbs. light oats, at 8d. per stone,	0	2	10½
128 stones 8 lbs. of straw at 3½d. per stone,	1	17	6
	L.4	11	4½

No. 4 produced 17 bushels 24 lbs. good oats, weighing 43¼ lbs. per bushel, at

2s. 9¼d. per bushel, ...	L.2	8	7¾
3 stones 11 lbs. of light oats, at 8d. per stone, ...	0	2	6¼
97 stones of straw, at 3½d. per stone, ...	1	8	3½
	L.3	19	5½

Results.

No. 1, at an expense of 8s. 3d., gained, over No. 4, 9s. 3½d., leaving a profit of 1s. 0½d.

No. 2, at an expense of 1s. 1½d., gained, over No. 4, 7s. 7½d., leaving a profit of 6s. 6d.

No. 3, at an expense of 4s. 8¼d., gained, over No. 4, 11s. 10¾d., leaving a profit of 7s. 2¼d.

II.—Experiment shewing the effect upon *Oats*, upon newly-ploughed lea, of *Ammoniacal Liquor*, a mixture of *Sulphate* and *Nitrate of Soda*, and *Bones dissolved in Sulphuric Acid*.

The soil in this field is a dry loam, rather gravelly, on a gravelly subsoil; was under hay crop in 1842, and the aftermath pastured with sheep, and some turnips consumed on it during the winter with sheep.

The oats, of the Hopetoun variety, were sown on the 15th of March, with the drill machine, across the ridges, at the rate of 4½ bushels per imperial acre; the quantity of land in each portion measured off was one quarter of an imperial acre, and the following special manures were applied on the 10th of May, when the braird was looking well, the weather being showery at the time.

No. 1. 20 gallons of Ammoniacal Liquor, diluted with 80 gallons of water, at a cost of 6s. 8d.
2. 21 lbs. Sulphate, and 21 lbs. Nitrate of Soda, mixed, at a cost of 5s. 3d.
3. 56 lbs. Bone-dust, 20 lbs. Sulphuric Acid, and 36 lbs. Wood-ashes, mixed, at a cost of 6s.
4. Nothing.

I examined them minutely on the 11th of June, and again on the 20th of July, and on both occasions Nos. 1, 2, and 3, shewed an evident superiority over No. 4, being taller, and a darker green colour, but No. 2 decidedly the best.

I cut the whole of them on the 5th September—a fair standing crop—Nos. 1, 2, and 3, all shewing more bulk on the ground than No. 4, but could not say which of the three was best. I had them carted home, weighed, and thrashed, on the 12th September, and, taking the prices as in Experiment I., the produce and value of each portion was as follows:—

No. 1 produced 14 bushels 15 lbs. of good oats, weighing 42 lbs. per bushel, at 2s. 8d.,	L.1 18 3¼
5 stones 7 lbs. of light oats, at 8d. per stone,	0 3 8
99 stones 6 lbs. of straw and chaff, at 3½d.,	1 9 0
	L.3 10 11¼

No. 2 produced 15 bushels 6 lbs. of good oats, weighing 42¼ lbs. per bushel, at 2s. 8½d. per bushel,	L.2 1 0
4½ stones of light oats, at 8d. per stone,	0 3 0
98½ stones of straw and chaff, at 3½d. per stone,	1 8 8¾
	L.3 12 8¾

No. 3 produced 14 bushels 2 lbs. of good oats, weighing 42½ lbs. per bushel, at 2s. 8½d.,	L.1 18 0½
4 stones 8 lbs. of light oats, at 8d. per stone,	0 3 0½
99 stones 11 lbs. of straw and chaff, at 3½d. per stone,	1 9 1¼
	L.3 10 2¼

No. 4 produced 13 bushels 16 lbs. of good oats, weighing 42½ lbs. per bushel, at 2s. 8½d.	L.1 16 2½
4 stones 5 lbs. of light oats, at 8d. per stone,	0 2 10¾
85 stones of straw and chaff, at 3½d. per stone,	1 4 9½
	L.3 3 10¾

Results.

No. 1, at an expense of 6s. 8d., gained, over No. 4, 7s. 0½d., leaving a profit of 1s. 4½d.

No. 2, at an expense of 5s. 3d., gained, over No. 4, 8s. 10d., leaving a profit of 3s. 7d.

No. 3, at an expense of 6s., gained, over No. 4, 6s. 3½d., leaving a profit of 3½d.

III.—Experiment shewing the effect upon a mixture of *Tares* and *Oats*, intended to be cut green, of *Gypsum*, *Sulphate of Soda*, and a mixture of *Sulphate and Nitrate of Soda.*

The soil in this field is a light loam, on a gravelly subsoil; was under a crop of oats in 1842.

The land, having been ploughed in the autumn of 1842, was well harrowed on the 2d of March following, and sown broadcast with three bushels per imperial acre, of Scotch tares, which were then ploughed in with a furrow of about four inches deep; and on the 30th of March, there was sown broadcast, at the rate of one and a-half bushel per imperial acre of late Angus oats, which were harrowed in. I had then four portions measured off, containing one quarter of an imperial acre each, to which the following manures were applied on the 11th of May, the weather being showery :—

No. 1. 112 lbs. of Gypsum, at a cost of 2s. 6d.
2. 56 lbs. of Sulphate of Soda, at 3s.
3. 21 lbs. of Sulphate of Soda, and 21 lbs. of Nitrate of Soda, at a cost of 5s. 3d.
4. Nothing.

On examining the field frequently during the summer, I could scarcely discern any difference between any of the four portions. No. 3 shewing a slight degree of superiority over the others, but not very marked. The whole of the field being luxuriant to a fault, these four portions were cut and weighed in the afternoons, when dry, between the 20th and 27th August, and the following are the weights of the different lots :—

No. 1	weighed	$50\frac{1}{4}$	cwt.
2	do.	54	do.
3	do.	$55\frac{1}{2}$	do.
4	do.	$50\frac{1}{2}$	do.

Results, valuing the crop at 1s. *per cwt.*

No. 1, at an expense of 2s. 6d., lost 3d., when compared with No. 4, and incurred an entire loss of 2s. 9d.

No. 2, at an expense of 3s., gained, over No. 4, 3s. 6d., and shewing a profit of 6d.

No. 3, at an expense of 5s. 3d., gained, over No. 4, 5s., and shewing a loss of 3d.

Had the soil in this field been poorer, I think the result would have been more in favour of the manures, as the whole of the crop was much too luxuriant, and rotted near the roots for want of air.

IV.—Experiment shewing the effect on the *Potato* crop of a variety of different manures, applied partly in the drill, with the seed, and partly as a top-dressing after the crop was fit for earthing up.

This field is a loam of medium quality, neither very light nor very clayey, on a mixed subsoil of clay and sand. It was drained in 1838, with drains 30 inches in depth, half-filled with small broken stones, and at 32 feet apart.

The field was all manured in the drill with horse and cow manure mixed, at the rate of 24 tons per imperial acre, at an expense of 7s. per ton. The manure was applied, and the potatoes, of the Don variety, planted on the 15th and 16th of May. I had twenty-four portions of one quarter of an imperial acre each measured off, each containing seven drills, and to those portions, from No 1 to No. 14, I applied the extra manures, in the drill, before the potatoes were planted, immediately after the horse and cow manure was spread, which I had then shaken up and mixed with the extra manures. And from No. 14 to No. 24 I applied the extra manures on the 14th of July, immediately before I hoed the potatoes for the last time, and earthed them up. The extra manures were applied with the hand around the stem of each plant. The potatoes were lifted and carefully weighed on the 9th and 10th of October.

The following is a state of the quantities of the extra manures, the cost, and the produce:—

		cwt.
No.	1. Nothing,	24
	2. 112 lbs. Gypsum, at 2s. 6d.,	27
	3. 168 do. Rape-dust, at 7s. 6d.,	29
	4. 168 do. Bone-dust, at 9s. 3d.,	28
	5. 84 do. Guano, at 8s. 3d.,	36
	6. 56 do. Artificial Guano, from Mr Baildon, druggist, Edinburgh, at 11s. 8d.,	34
	7. 20 bushels of Soot, at 5s.,	25
	8. 21 lbs. of Sulphate of Soda and 21 lbs. of Nitrate of Soda, mixed, at 5s. 3d.,	27¼
	9. 21 lbs. of Sulphate of Soda and 21 lbs. of Sulphate of Ammonia, mixed, at 6s. 4½d.,	29¼
	10. Nothing,	26
	11. 21 lbs. Nitrate of Soda and 21 lbs. Sulphate of Magnesia, mixed, at 7s. 7½d.	26
	12. 21 do. Sulphate of Soda and 21 lbs. Nitrate of Potash, dry, mixed, at 9s. 10½d.	27¼
	13. 112 do. Common Salt, at 3s. 4d.	24
	14. Nothing,	24

The following were top-dressed on the 14th July:—

No.	15. 20 bushels of Soot, at 5s.	28½
	16. 21 lbs. Sulphate of Soda and 21 lbs. Nitrate of Soda, mixed, at 5s. 3d.,	27½
	17. 21 do. Sulphate of Soda and 21 lbs. Sulphate of Ammonia, mixed, at 6s. 4½d.	28
	18. 84 do. Guano, at 8s. 3d.,	39½
	19. 56 do. Artificial Guano, at 11s. 8d.	25¾
	20. 21 do. Sulphate of Soda and 21 lbs. Sulphate of Magnesia, mixed, at 9s. 10½d.,	27
	21. 112 do. Gypsum, at 2s. 6d.	27½
	22. 42 do. Nitrate of Soda, at 8s. 3d.	27
	23. 21 do. Sulphate of Soda and 21 lbs. Nitrate of Potash, mixed, at 9s. 10½d.	28
	24. Nothing,	25

I may mention here that all the different portions dressed with the extra manures turned out very much according to their appearance above ground, except Nos. 7 and 15, dressed with soot, as they shewed more improvement above ground than any of the others except No. 5, which all along looked best; and those portions which were the best crop had fewest small potatoes amongst them. Indeed the whole field, although very regularly planted, shewed a tendency to curl, and wanted that broad leaf and vigorous growth which indicate a full crop. I had the seed brought a distance of twenty miles from a high district of the country. I may here also mention that I had another trial with the first thirteen of these extra manures in a field of Buff potatoes, which was manured on the stubble, in the month of November, at the rate of 30 tons per imperial acre of cow and horse manure mixed, at an expense of 7s. per ton, the extra manures being applied in the drill with the seed. The crop was much superior to that of the field of Dons, the increased produce by the application of the extra manures was also much greater; but as the

relative proportionate increase, by the different extra manures, was so very nearly similar to that already stated, I have not recorded it here, as it threw no additional light on the subject.

V.—Experiment shewing the effect upon the *Turnip* crop of the application of *Bones*, *Burned Bones*, and *Sulphate of Soda*, the whole being also similarly manured with farm-yard manure.

The soil in this field consists of a deep-blackish loam on a mixed subsoil. It was drained in 1837 with stone drains 30 inches deep and 32 feet apart, half filled with small broken stones. I selected four portions, of four drills each, containing one quarter of an imperial acre in each portion. The whole was manured with horse and cow manure at the rate of 20 tons per imperial acre, at 7s. per ton; the extra manures were sown with the hand in the drill above the horse and cow manure, which was then shaken up and mixed with the extra manures. The turnip seed, being Skirving's red-top yellow, was sown on the 7th of June. The following is a state of the kinds and quantities of the extra manures, and their cost, with the weight of turnips produced; the turnips were pulled on the 19th October, and the roots and shaws taken off before being weighed; but, as the turnip crop had not arrived at full maturity, I only lifted one drill from each portion, the weight of which I multiplied by four, which must be very nearly equal to lifting the whole, as the four drills in each portion were treated, in every respect, alike; besides it will enable me to test again, about the end of November, when the crop is fully ripened, the further comparative increase in weight of the different portions:—

	Tons.	Cwt.
No. 1, 112 lbs. of Bone-dust, at 6s. 2d.,	5	17
2, 112 do. of Burned Bones, at 5s.,	6	6
3, 56 do. of Sulphate of Soda, at 3s.,	5	14
4, Nothing,	6	15

The whole of the turnips in this field are a very full crop, but I could not distinguish any difference between the portions dressed with the extra manures and those which got nothing at any time during the summer. The same remark applies to the portion of the field which I had dressed, extra, with bones and sulphuric acid mixed, guano, kelp, &c.*

* The turnips were weighed on the 28th of November, and gave—

	Tons.	Cwts.
No. 1,	6	15½
2,	7	2
3,	6	6
4,	6	6½
5, Manured with Bones and Sulphuric Acid, at 6s.,	6	16
6, ½ cwt. Guano, at 6s.,	7	8
7, 2 cwt. Kelp, at 6s.	6	7

Nos. 5, 6, and 7 were not weighed in October.

I had another small experiment of top-dressing turnips, which was, however, not very minutely followed out: it was gone into more with the view of turning to a profitable account a quantity of the extra manures which I had been using, which were left over, than making any experiment: they consisted of sulphate and nitrate of soda, saltpetre, sulphate of ammonia, and guano; in all, about 6 cwt. I had them well mixed together, and applied with the hand round the root of the plants, on the 25th July, to about 3½ imperial acres of turnips, which were latest and most backward. In about ten days after the application, the turnips in the drill where the top-dressing commenced, and where it stopped, were quite obvious even from a considerable distance, being much darker in colour and stronger in the shaw; and during the summer they continued to improve more rapidly than the undressed portions of the field; so that, from being the worst, they are now fully as good as any other part of the field.

VI.—Experiment shewing the effect upon *Grass* intended for *Hay* of *Sulphate of Soda*, *Common Salt*, and *Nitrate of Soda*.

The field on which this experiment was made is part of a farm situated about 280 feet above the level of the sea, and distant from it about six miles, with a southern exposure. The soil, which is a lightish loam on a mixed subsoil of sand and clay, is wet, not having been drained. It had been under potato crop in 1841, and oats, with seeds, in 1842; and in the spring of 1843 was well planted with rye-grass and red clover. The following manures were applied to one quarter of an imperial acre each, on the 28th of April, in showery weather:—

		Imp. St.
No. 1,	56 lbs. Guano, cost 5s. 6d.; produce in hay,	90¼
2,	do. Sulphate of Soda, 3s.	84¾
3,	do. Common Salt, 1s. 8d.	83¼
4,	do. Nitrate of Soda, 11s.	113
5,	Nothing,	106¾
6,	56 lbs. Common Salt, and 112 lbs. Gypsum, mixed, 4s. 2d.,	86½

In the month of May, No. 4 looked decidedly best, and No. 3 worst; but before being cut, No. 1 looked fully as well as No. 4; and when cut, Nos. 1 and 4 were each of them a more bulky crop than any of the others; and when the hay was ricked, each of the portions in a separate rick, the rick of No. 1 was much larger than No. 5, although it weighed lighter.

There was no perceptible difference in the appearance of the second crop on the respective portions.

REPORT OF EXPERIMENTS ON SPECIAL MANURES IN 1843.

By Mr Robert Russell, Easter Kilwhiss, by Auchtermuchty, Fifeshire.

[Premium—Seven Sovereigns.]

I.—*Clover Hay.*

Soil inferior in quality, sandy, with a mixture of moss; surface-soil 1½ foot in thickness, resting upon marly clay; drained in summer 1842; the rotation for the last four years was as follows—1st, old pasture; 2d, oats; 3d, turnips; 4th, barley, the last sown with a mixture of red and white clovers, with perennial rye-grass, which held pretty well considering the nature of the ground. The plots were dressed with the substances on the 11th April, and hay was cut on the 5th of July, and weighed on the 1st August.

No.	Description of Manures.	Weight of substances applied on ¼ Acre Imperial.	Produce on ¼ Acre.	Cost of Applications per Acre.	Produce per Acre in Imperial Stones.	Additional Hay per Acre.	Cost of Additional Hay per Imp St.
		lbs.	lbs.	s. d.	st	st.	s. d.
1.	Nitrate of Soda,	40	693	28 6	198	34.	0 10
2.	{ Guano, { Gypsum,	56 56	1008	31 0	288	124.	0 3
3.	Sulphate of Soda, (Crys.)	83	576	24 0	164.8	8.	
4.	Nothing,		574		164		
5.	Common Salt,	84	612	6 0	174	10.	0 7
6.	Guano,	56	1013	25 0	289.6	125.6	0 2¼

The weather was dry at the time the different substances were applied. On the 25th April, No. 1 was assuming a dark green colour; Nos. 2 and 6 were improving; No. 5, of a lighter green colour than the others. 10th May, Nos. 1, 2, 6 were observable a good distance away, by the rapid progress they were making; little difference on Nos. 3 and 5. Throughout June, Nos. 2 and 6 took the lead, and it may be worthy of notice that No. 1 was a little ate with game, although there are comparatively few on the grounds, whilst the others were untouched. The stubble was pastured in Autumn, Nos. 2 and 6 were much thicker in the sole than No. 4; Nos. 1 and 5 were also improved a little.

II.—*Clover Hay.*

Soil good quality, loam lying upon trap rock; surface-soil about 2 feet thick, dry, with south exposure; the rotation for the last six years as follows:—1st, grass; 2d, barley; 3d, oats; 4th, turnips; 5th, wheat; 6th, barley, the last sown out with a mixture of clovers and rye-grass. On the 20th April, when the substances were applied, the grass was thin; it was cut on 19th July, and the hay weighed on the 11th of August.

No.	Description of Manure.	Weight of Substances applied on 1-12th Acre.	Produce on 1-12th Acre.	Cost of Applications per Acre.	Produce per Acre of Imperial Stones.	Additional Hay per Acre.	Cost of additional Hay per Imp. Stone.
		lbs.	lbs.	s. d.	st. lbs.	st. lbs.	
---	Sulphate of Soda,	21	192	17 6	164 8	...	loss
1.	Common Salt,	28	221	6 0	189 6	...	loss
2.	Nothing, . .	...	224	...	192 0	...	...
3	Guano, . . .	15	268	20 0	229 10	37 10	$6\frac{1}{4}$d.
4.	Nitrate of Soda,	10	335	21 6	287 0	95 2	$2\frac{1}{4}$d.
5.							

By the 3d May, Nos. 4 and 5 were shooting out very vigorously, of a dark green colour: none of the other applications seemed to be attended with any effect. No. 5 latterly took the lead of No. 4, and continued to do so to the time they were cut.

III.—*Tares and Oats.*

Ground very inferior; sandy surface-soil; with marly subsoil, incumbent upon gravel; rather wet, and not in good condition; oats last year after several years' pasture; the land was ploughed and press-rolled for seed on the 26th April, and sown on the 1st May with 2 bushels of tares and 2 bushels of oats per acre; Nos. 2 and 3 put in along with the seed; Nos. 1 and 5 on the 9th June, when the plants were about 3 inches above the ground; a shower of rain fell immediately after the latter plots were dressed.

No.	Description of Manures.	Weight of Substances applied on $\frac{1}{4}$ acre.	Cost per Acre of Applications.	Weight of Tares and Oats on $\frac{1}{4}$ Acre, per Stone of 22 lbs.
		lbs.	s. d.	st. lbs.
1.	Sulphate of Soda, (dry,)	45	11 3	63 18
2.	Gypsum, ...	60	8 9	58 0
3.	Bones 20 lbs., and Sulphuric Acid 20 lbs.,	40	10 0	144 0
4.	Nothing, ...	...	...	Unweighed.
5.	Nitrate 20 lbs., Sulphate of Soda 25 lbs.,	45	20 6	do.

On the 9th June, when the plots Nos. 1 and 5 were dressed, No. 3 was much improved throughout its whole length; the plants

were assuming a fine light-green colour and broader leaf; there was no difference whatever on No. 2 during the summer; No. 3 kept a marked superiority over the others, which were never perceptibly affected. On the 19th September, when Nos. 1, 2, and 3 were cut and weighed, No. 3 might be observed from a considerable distance across the field, being much taller than the surrounding plots, and the oats rising above the tares ripe and well filled, while on the others they were quite green. Nos. 1, 2, 3 were only weighed as a sample of the others, but even these results do not give a just estimate of the value of the crops, as there was a good deal more grass and weeds among Nos. 1 and 2 than No. 3, and a better idea is thus formed of the comparative merits of the applications than can be given by inspecting any specimen of tares and oats from Nos. 3 and 5, taken where the land was, as nearly as possible, equal in quality, and which circumstance clearly shews the direction improvement must take on this soil, as all the other substances were entirely thrown away.

IV.—*Sandy Oats.*

Soil of a loamy moss, occupying an extensive depression in the surrounding gravel, varying from 30 to 40 feet in thickness; it is rather wet, as draining is very impracticable for want of level; however, it dries rapidly during the spring and summer, as there is no spring water, on account of the unusual depth of the moss. There is a peculiarity in the appearance of the oats and barley that grow upon it in its natural state; although the oats get quite ripe in the ear, they never do so at the bottom of the stalk, but continue green till cut; the same is the case with the barley, which is green both in the straw and ear. A remarkable difference is observed on the latter crop when the land is covered with a coating of gravelly sand, which is much esteemed for building purposes; it is 10 days sooner ready to cut, and the straw is white and hard. These appearances are not dependant on the want of drainage, as they are observed where the land is quite dry. Bone manure has a very permanent effect on this land. On an adjoining field of the same lacustrine deposit that was dressed thirteen years ago with 25 bushels of bone-dust per acre, every alternate 24 yards, the old-boned portions are distinctly seen at the present day, the cattle always preferring the grass growing upon them. The field upon which the following experiments have been made has never been manured, but repeatedly pared and burned; it was ploughed up last autumn, after lying a number of years in meadow pasture, much overgrown with rushes. No. 1 was sown along with the oats on the 8th April. No. 2 top-dressed on the 6th May; and No. 3 on the 3d June. The crop was cut on the 20th September; stacked on the 28th; and thrashed on the 18th October:—

No.	Description of Manure.	Weight of Substances applied per 1-4th Acre.	Cost of Applications per Acre.	Chaff and Straw per 1-4th Acre.	Grain on 1-4th Acre.	Seconds per 1-4th Acre.	Grain per Acre.	Weight of Straw per Acre.	Weight of Grain per Bushel.	Cost of additional Oats per Bushel.	Value of additional Straw per Acre at 2d. per Stone of 14 lbs.
		lbs.	s. d.	lbs.	bus. lbs	lbs.	bus. lbs.	st.	lbs.	s. d.	s. d.
1.	Bone-dust, .	112	22 6	1289	18 5	52	72 20	368	40	1 0¼	15 8
2.	Sulphuric Acid, Bones, . . .	26 20	10 0	1055	15 18	64	61 30	301	41¾	0 10¼	4 6
3.	Nit. and Sulph. of Soda, . .	20 20	19 0	961	12 22	70	50 6	274	41	...	...
4.	Nothing, . .	..	...	...	...	...	...	...	...	...	...

On the 9th June, No. 1 was thicker than the surrounding crop, No. 3 was improved a little. 1st August, No. 1 still the best, very close on the ground, and all of one length. No. 2 not so equal. No. 3 taller than any of the rest, and darker coloured, but unequal in length. By the 1st September, Nos. 1 and 2 were much laid; Nos. 3 and 4 standing. By accident, No. 4 got wet before it was thrashed, and as its weight could not be depended on, No. 3 is taken as the basis of calculation, as there was little apparent difference, when stacked, between Nos. 3 and 4.

V.—*Hopetoun Oats.*

Soil blackish loam, (1 foot thick resting upon gravel,) of good quality; a fine turnip and clover soil, but rather too dry; south exposure; the rotation for the last 5 years was, 1st, pasture; 2d, barley; 3d, potatoes; 4th, wheat; 5th, hay; the lea was ploughed in autumn, and the oats sown on 30th March. No. 2 was dressed on the 28th April during wet weather, and Nos. 1 and 3 on the 30th May, and a good deal of rain fell immediately after they were dressed. The oats were cut on 9th September, and weighed and thrashed on 22d.

No.	Description of Manure.	Weight of Substances applied per 1-4th Acre.	Cost of Applications per Acre.	Weight of Dressed Grain per 1-4th Acre.	Weight of Straw and Chaff per 1-4th Acre.	Weight of dressed Oats per Bushel.	Weight of Seconds per 1-4th Acre.	Quantity of Dressed Grain per Acre.	Decrease† and Increase* of Dressed Oats per Acre.	Value of additional Straw at 3d. per Stone per Acre.	Cost of additional Oats per Bushel.
		galls.	s. d.	lbs.	lbs.	lbs.	lbs.	bush. lbs.	bush. lbs.	s. d.	s. d
1.	12 Galls. Gas-water, at 3s., Sulph. of Ammonia, . .	12 lbs. 14	22 8	487	686	42	18	46 16	*8 4	1 9	2 10
2.	Vitriol . . . Bones . . .	20 20	10 0	366	551	42	24	34 36	†3 18	...	...
3.	Sulph. of Soda, Nit. of Soda,	20 20	19 3	435	663	42	39	41 18	*3 6	0 3	6 1
4.	Nothing . .	...	...	402	662	42	40	38 12	...	...	...

The gas-water was applied to No. 1 on 30th May, diluted with five times its bulk of water. It was very impure, and the plants suffered a little afterwards, but they rapidly recovered, and kept a darker colour throughout the summer. 10th June, No. 3 improved very much; broader in the leaf and darker in the colour than No. 4 or any of the others. The severe drought in the end of June checked it as well as the other plots, and it never regained its relative superiority. I have no doubt it might be used with advantage on this soil were the season more favourable. No. 2 never improved, and latterly got a lighter colour than any of the other numbers. There might be a little difference in the quality of the soil in this case to account for the result.

VI.—*Barley.*

Soil dry "deaf" loam upon gravel; bad turnip land naturally. This field had been lying in old pasture previous to 1839, when a crop of oats were taken, and turnips, rye, turnips, and barley, in succession—the last sown on the 13th April, along with a mixture of rye-grass and clovers, and the following dressing on the 23d May:—1st, nitre, 128 lbs. per acre, value £2; 2d, common salt and nitrate of soda, (72 lbs. and 68 respectively,) value £1; and 3d, common salt, at the rate of 160 lbs., value 3s. per acre. The weather was wet at the time they were dressed, and some of the plots were attacked and injured with wire-worm. For this reason the crop was not weighed, as the results could not have been satisfactory. No difference was apparent on any of the plots during the summer. When cut, on the 4th September, No. 1 was a little taller than the surrounding crop, but hardly so ripe; No. 2 also a little taller—the ear of a reddish colour, and the straw bluish; and No. 3 had the same appearance, although it was no taller than the others. The latter numbers rather seemed to be forced into an unnatural condition. The sole of grass was not good, and did not appear to have been improved by any of the applications.

VII.—*Turnips*—(*Green-top Yellow.*)

On a field adjoining the barley, (Experiment VI.,) of same character and quality, five drills were selected for each plot, measuring one-quarter of an acre; but as the rotation on the one end of the drills on which the experiments were made had been different from the other end, and the results shewn a corresponding difference, I have given them separately as well as together, as they illustrate a most important principle; the whole of the ground was manured with six loads of farm-yard dung, well prepared, per acre; the substances were sown above the

dung. The seed was sown on the 21st June; the weather dry and warm at the time, but the ground moist, and a beautiful braird was obtained. The rotation on Experiment VII. with turnips, for the last four years, was—1st, old pasture; 2d, oats; 3d, turnips, (*manured with ten bushels of half-inch bones, and ten loads of straw-yard manure;*) 4th, barley: and on Experiment IX.—1st, old pasture; 2d, oats; 3d, pease, (*manured with ten loads of straw-yard dung;*) 4th, barley. The turnips were singled out on 29th July. No. 1 was the best braird; No. 6 very little behind, more equal than Nos. 3 or 2; Nos. 4, 5, and 7, bad.—*15th August.* No. 1 still best; No. 6 falling behind No. 2; No. 3 was later than No. 2, and darker coloured. These appearances were somewhat common to both the ends of the drills. The turnips were topped and tailed on the 14th October, and weighed on the 16th.

VIII.—*Turnips*—(1-9*th of an Acre Imperial.*)

No.	Description of Manure.	Weight of Turnips on 1-9th Acre.		Produce of Turnips per Acre.		Additional Turnips per Acre.		Cost of Additional Turnips per Ton.	
		cwt.	lbs.	tons.	cwt.	tons.	cwt.	s.	d.
1.	Guano, ...	18	62	8	6	5	18	6	4
2.	Bone-dust, ...	14	110	6	15	4	7	6	10
3.	{ Bone-dust, and Nit. and Sulph. of Soda, }	14	29	6	8	4	0	8	0
4.	Nit. and Sulph. of Soda,	8	3	3	12	1	4	18	4
5.	Sulphate of Ammonia, .	7	18	3	4	0	16	34	4
6.	{ Bones dissolved in Vitriol (13 lbs. bones ¼ acre,) }	11	100	5	7	2	19	1	6
7.	Dung alone, ...	5	46	2	8	...		...	

The south end of the drills in Experiment VIII.—By the 7th September, No. 1, best crop; No. 2, the second; No. 3, keeping a fine dark colour, and improving very much. No. 6 was superior to Nos. 4, 5, and 7, which were very irregular, but some good turnips to be found in the drills, evidently where they had come in contact with the pieces of *half-inch bones* applied two years ago.

IX.—*Turnips*—(1-7*th of an Acre Imperial.*)

No.	Description of Manure.	Weight of Turnips on 1-7th Acre.		Produce of Turnips per Acre.		Additional Turnips per Acre.		Cost of Additional Turnips per Ton.	
		cwt.	lbs.	tons.	cwt.	tons.	cwt.	s.	d.
1.	Guano, ...	18	27	6	7	5	14	6	6
2.	Bone-dust, ...	19	14	6	13	6	0	5	0
3.	{ Bone-dust, and Nit. and Sulph. of Soda, }	18	46	6	8	5	15	5	6
4.	Nit. and Sulph. of Soda,	1	105	0	13	...		loss.	
5.	Sulphate of Ammonia, .	0	77	0	4	...		loss.	
6.	Dissolved Bones, . .	10	52	3	13	3	0	1	6
7.	Dung alone, ...	1	97	0	13	...		...	

The north end of drills in Experiment IX.—On 7th September there hardly was a turnip worth the pulling on Nos. 4, 5, and 7. They had the most miserable appearance that could be conceived. No. 6 was inferior to Nos. 1, 2, and 3, and not thriving well.

X.—*Turnips, adding Experiments* VIII. *and* IX. *together, amounting to* 1-4*th Acre each Plot.*

No.	Description of Manure.	Weight of Substances applied on 1-4th acre.	Cost of Substances applied per Acre.	Produce on 1-4th Acre.	Produce on Imp. Acre.	Additional Turnips per Acre.	Cost of Additional Turnips per Ton.
			s. d.	cwt. lbs.	tons. cwt.	tons. cwt.	s. d.
1.	Guano, . . .	84 lbs.	37 6	36 89	7 7	5 18	6 4
2.	Bone-dust, . .	3 bus.	30 0	34 12	6 16	5 7	5 7
3.	Bone-dust, . .	1 bus.	10 0 } 32s.	32 75	6 11	5 2	6 3
	Nitrate (17lbs.) and Sulphate of Soda, (40 lb.) dry,	57 lbs.	22 0 }				
4.	Nitrate and Sulphate of Soda,	57 lbs.	22 0	9 108	2 0	0 11	
5.	Sulph. of Ammonia,	35 lbs.	27 6	7 95	1 11	0 2	
6.	Dissolved Bones,	13 bones. 9 sul. ac.	4 6	22 40	4 9	3 0	1 6
7.	Dung *alone*, . .	...	...	7 31	1 9		

XI.—*Turnips*—(*Green-top Yellow.*)

Surface-soil dry sandy loam, close texture, about 1½ foot in thickness, incumbent upon sandy gravel. It lies flat, and is rather exposed. The rotation for the last four years was, 1st, old pasture; 2d, oats; 3d, potatoes; and 4th, wheat. The ground was ploughed to the depth of 14 inches last autumn. On 15th June the drills on all the plots were dressed at the rate of 12 loads of farm-yard manure per acre, and after being spread, the various substances were sown amongst it. The turnip seed (green-top yellow) was sown the same day. The turnips were topped and tailed on the 14th October, and the crop was weighed on that day.

No.	Description of Manure.	Weight of Substances applied on 1-4th Acre.	Cost of Application per Acre.	Produce on 1 4th Acre.	Weight of Turnips per Acre.	Additional Turnips per Acre.	Cost of additional Turnips per Cwt.
		lbs.	s. d.	cwts. lbs.	tons. cwts.	tons. cwts.	s. d.
1.	Burned Bones, .	71	21 0	31 6	6 4	2 1¾	0 6
2.	Bone-dust, . .	160	29 0	33 5	6 12	2 9¾	0 7
3.	Bone-dust, .	160	29 0	36 92	7 7	3 4¾	0 7½
	Sulp. of Soda,	50	12 6				
4.	Sulphate of Soda,	50	12 6	20 65	4 2	...	loss
5.	Dung alone, .	...	...	20 65	4 2	...	...
6.	Guano, . .	84	37 6	34 56	6 18	2 15½	0 8

The weather was dry when sown, and a good braird was obtained; they were singled out on 11th July. Nos. 1, 2, 3, stronger braird than Nos. 4 and 5. No. 6 the best. 19th August, No. 6 had the best appearance, No. 3 the second; if anything No. 2 was rather better than No. 1, both much superior to Nos. 4 and 5, which could be observed from a distance by the small progress they were making. 2d October, Nos. 1, 2, 3, and 6, were losing colour and getting ripe, Nos. 3 and 6 still seemed to be best, Nos. 4 and 5 were keeping green in colour, but not rooting well. These experiments were made on the best piece of ground in the field, which was all dressed with bone-dust and straw-yard manure. I left several drills throughout the field done with straw-yard manure alone, and, where the quality of soil was not so good, the difference was nearly as great on the boned and unboned drills as that between No. 7 and 2 in Experiment IX.

XII.—*Potatoes*—(*Blue Don.*)

On the same field as last experiment, and soil of similar quality and character; the rotation for the last four years was, 1st, old pasture; 2d, oats; 3d, turnips; 4th, barley. This is not a good potato soil naturally, the potatoes being generally soft even in the driest seasons, the granules of starch being small when boiled, and not bursting well. The ground was deep ploughed in autumn last; farm-yard manure was spread in the drills at the rate of 12 loads per acre on all the plots, with the exception of No. 6, which got none; the potatoes on this No. were planted in the bottom of the drills, and then slightly harrowed down, and the guano sown above. The dissolved bones were put in amongst the dung in a fluid state, before it was applied to the land, the other substances were sown above the dung. The potatoes were planted on the 11th May, the weather being at the time very hot and dry. The crop was lifted and weighed on the 16th of October.

No.	Description of Manure.	Weight of Substances applied on 1-4th Acre.	Cost of Substances applied per Acre.		Weight of Potatoes on 1-4th Acre.		Weight of Potatoes per Acre.		* Decrease & +Increase of Potato per Acre.
			s.	d.	cwt.	lbs.	tons.	cwt.	cwt.
1.	Dung *alone*,	...	...		16	0	3	4	...
2.	Soot,	6 bush.	8	0	14	19	2	19	*5
3.	Bone-dust, / Sulphuric Acid,	23 lbs. / 20 lbs.	11	0	16	84	3	7	+3
4.	Sul. of Soda (Crystals,) & / Nitrate of Soda,	70 lbs. / 21 lbs.	36	0	13	90	2	15	*9
5.	Sulphate of Soda, and / Sulphate of Ammonia,	70 lbs. / 21 lbs.	41	6	16	50	3	5	+1
6.	Guano *alone*,	84 lbs.	37	6	14	49	2	17	*7

The most of the potatoes seemed to be predisposed to rot this season, and to vary in amount of failure according to circumstances. Where the sets were not in contact with the manure No. 6 there were few or no blanks, but all the others were blanky. 10th July, Nos. 4, 5, and 6, were darker in the colour than the others, more especially the last. No. 4 was broader in the leaves, and of a light green colour. 27th September, the leaves of No. 6 were faded away, Nos. 1, 2, 4, 5, keeping their colour, Nos. 4 and 5 more so than the others. No. 3 ripe yellow colour, and when taken up were of fine quality. No. 2 was light in weight and not so good.

General Remarks.—As any attempt, on my part, to have given analyses of the various soils on which these experiments have been made, would have proved unsatisfactory, and could not have admitted of any practical application, it occurred to me that a description of the crops that grew upon them, and their general character, would be of more benefit. No doubt the analyses which have already been made by men of eminence, shew us the true direction in which we may obtain a knowledge of the particular wants of any soil, but these are far beyond the reach of the agriculturist; yet he can arrive at a knowledge of those wants, sufficient for every practical purpose, (provided there are no deleterious ingredients present,) by observing the actual and relative effect upon the different crops of specific substances, as if he had the soil completely analyzed before him. For instance, it may be very safely inferred, from the preceding experiments and the following facts, that all these soils, (with two exceptions, Experiments II. and V.,) are very deficient in phosphoric acid; and any person to judge of their value as turnip land would be very much misled, for none would seem better adapted; but the very reverse is the case, as we find from experience that that crop cannot be cultivated with advantage or profit (which chemists tell us requires a considerable quantity of that material) without the addition of bone-manure, or some other containing the phosphates, to the farm-yard dung.

In an adjoining field to Experiment XI. of turnips, and to Experiment XII. on potatoes, of the same character, but hardly so close in texture, which was dressed only at the rate of 20 bushels of *bone-dust* per acre thirteen years ago, it had lain, every alternate twelve yards, for some time previous to 1841, in waste pasture, a crop of oats were then taken, and turnips last year, manured at the rate of ten loads of straw-yard dung of good quality. At the time the turnips were singled out, they all looked equally well; but latterly the old boned portions turned

out a crop of turnips four times the bulk of the others, one-half of which were ate off with sheep during the winter 1842–43, and sown in barley 2d April. By the end of May, the old-boned portions were seen across the field, which had been laid down in broad ridges the reverse way, of a much healthier appearance. As the line of demarcation was very distinct at that time, I staked off four ends where the land was equal in quality, amounting to one-fourth acre of each kind. The crop was cut on the 2d September, and thrashed out on the 11th from the stook; the straw was not weighed.

No.	Description of Manure.	Produce 1-4th Acre.	Seconds on 1-4th Acre.	Weight per Bushel.	Produce per Acre.	Value of Dressed Grain per Acre.
		bush. lbs.	lbs.	lbs.	bush. lbs.	
1.	Old Boned, .	9 3	10	57	36 14	@ 28s. p. qr., £6 : 6s.
2.	Not Boned, .	7 50	15	56	31 19	... 27s. ... 5 : 8s.

On the 1st June, the prospective difference of value of the crop on Nos. 1 and 2 was much greater than the results have actually turned out. No. 1 was then much thicker on the ground, having tillered out greatly. From the unretentive nature of the soil, the crops suffered much during the dry weather in June and beginning of July, more especially No. 1, which was too thick on the ground, and presented a smaller ear; No. 2 never had so good a colour as No. 1, but a good many green heads. On another portion of the same field, where none of the turnips were ate off, the difference of value was much greater. Another field of similar character to Experiment VIII. on turnips, was treated in the same manner as the above; and about the same time, also on the barley this season, the effects of the dressings were very visible as well as on the turnips and oats in the two former rotations; and before the field was broke up in 1841, the pasture was much better on the boned part, a change in some of the natural grasses having taken place, and the sheep always kept it comparatively short. Several other instances might be mentioned, which occurred in my experience, of a similar kind.

From these facts, it is obvious that the bone-dust has not been consuming in the soil at more than 2 bushels an acre per annum, and that, however small a constituent of those crops that proportion really is, it is capable of exerting an immense improvement upon them, and if it is a law in the constitution of some plants, that, to a certain extent, no other substance can take the place of the phosphates, which there is little reason to doubt,

from the important place which it occupies in the animal economy, and the connexion which subsists between the animal and the vegetable kingdoms, is it to be wondered at, since the physiologist makes known to us that the bone must have its phosphate and the albumen its phosphorus, that these saline substances should have been attended with no better success, when constituents so essential as the phosphates exist in so sparing a quantity in the soil; and we naturally arrive at the conclusion that the nitrates, sulphates, &c., of alkaline or earthy bases, cannot be used economically upon soils which are deficient of phosphoric acid.

Action of bone-dust.—This is a subject upon which very few practical men agree, and a kind of prejudice is creeping in, in some quarters, against the use of this manure, which is partly encouraged by men of science, as is expressed by a writer on agricultural chemistry, that "bone manure acts more in the way of a stimulus, or rather it acts indirectly, by calling into activity the organic matter previously existing in the soil, and the constant use of bones deteriorates the soil."—(Dr Madden, in the Quarterly Journal of Agriculture.) It is difficult to conceive how phosphate of lime can exert a decomposing effect on vegetable matter, when it rather acts as an antiseptic, on the associated animal matter of bones. From the facts already adduced, it is evident that a small quantity of what is generally applied is taken up by the crop; if half-inch bones are examined after a crop of turnips have grown from them, they seem to have suffered very little diminution in bulk; but nature is very economical in her workings, and in this case furnishes a beautiful instance of the power which vegetables possess of selecting those substances which are adapted for their particular wants. As soon as the roots of the turnips came in contact with the pieces of bone, they immediately entwine themselves around them, and form an integument of closely-matted fibres, completely excluding the action of the soil, unless in so far as it merely furnishes them with a supply of moisture, and any other materials in solution. The bones can thus exert no stimulating action on the soil, as they are completely shut up from it, and bone manure can only act by giving the plants the power or capacity to assimilate those materials which are *already* within the reach of the roots or leaves.

Action of sulphate and nitrate of soda.—It cannot be a fair conclusion which is often drawn when certain substances are applied singly to any soil, and found to be negative in their effects. That they are of no use on that soil as fertilizers, the fault may lie in

the want of other indispensable substances, in sufficient quantity to allow the plants to appropiate or make them subservient in assimilating or secreting any of its particular products. I know of an instance where nitrate of soda was applied to turnips, and had entirely failed on land somewhat similar to that on which these trials were made, and has since been condemned as quite worthless; but, on reference to both Experiments VIII. and XI., on turnips, it appears that the absence of the phosphate of lime was the direct cause of the negative effects of the sulphate of soda, as well as the nitrate of soda, and even on these soils, both these substances might be used with economy, by applying them in proper proportions along with others.

In regard to the method of testing the various artificial manures, little need be said, as those who are at all competent to undertake that will best satisfy themselves by reference to any work on chemistry. *Dissolved bones* are best prepared by putting the common bone-dust through a wheat sieve, and throwing the powder into an iron vessel, with half its weight of sulphuric acid, and the same quantity of water, and, after standing a day, they can be transferred to a wooden vessel, and more water added, and allowed to macerate until all the larger pieces of bones are soft; then they can either be diluted with water and applied to the land from a water-cart, or mixed with moss or mould, and sown over the land in the state of soluble super-phosphate of lime. It may be easily dried by mixing a little powdered lime amongst it: in this way it is reconverted into phosphate of lime. It was applied in this state to the tares and oats, in Experiment III., and also IV. and V., and it answers very well for old pasture. Its effects are very rapid, but it is not so well adapted for top-dressing white crops, as it is not so soluble. When applied in this state it should be put in along with the seed, to allow the roots to act upon it. This certainly promises to be a very valuable manure on those soils which are deficient of phosphates.

ON THE INFLUENCE OF THE SOIL IN VEGETATION.

By A. Gyde, Esq., Painswick, Gloucester.

[Premium—The Silver Medal.]

Before the researches of Liebig and Sprengel were made known, the chemistry of agriculture was involved in considerable obscurity, few men of science devoted their attention to it, and those few met with so little encouragement to pursue the subject, that they preferred following in the more beaten track of science to the then uninviting study; but the report of Liebig to the British Association on the application of chemistry to agriculture, and the work of Sprengel, who has made so many analyses of the ashes of plants and soils, have given a new stimulus to this branch of science, and the subject is now in a fair way of receiving that share of investigation which it deserves, and which promises to be of so much benefit to mankind.

The author of the following paper has endeavoured to trace, in as brief a way as is consistent with clearness, the connexion between the soil and the functions of germination and growth of the plant, and as he has verified, by direct experiment, much of the matter contained in it, he can rely on its correctness.

In order that we may be enabled to form a clear idea of "what would constitute the best admixture of the ordinary elements of a soil, and its influence on the germination and growth of particular vegetables," it will be necessary, in the first place, to examine into the circumstances under which germination takes place, and the offices performed by the soil in the subsequent growth of the plant; and, secondly, to consider the chemical and mechanical composition of that soil which is best suited to perform these various offices required of it by the plant.

It is a well established fact, that before the germination of a seed can take place, the following conditions are necessary:—

1*st*, The presence of *moisture*, since no seed, when dry, is capable of germinating: Hence, the first step towards the germination of a seed being the absorption of water into its texture, without which, those molecular changes are incapable of being carried on, which are so necessary for the conversion of the starch and other constituents of the grain into food, fitted to nourish the embyro plant.

2*d*, The presence of a certain degree of *heat*, since no seed is capable of germinating at a temperature below the freezing point of water.

After a seed has absorbed a sufficient amount of water, if the

temperature be reduced below the freezing point no germination will take place, although the vegetative properties of the seed will not be materially impaired. We have sufficient proof of this fact in the length of time some seeds will remain in an ice-bound soil during winter, and yet vegetate with full vigour when warmed by the general heat of returning spring.

The influence of temperature in promoting the germination of seed may be seen in the following experiment:—

Let two vessels be filled with the same description of soil; let seed from the same sample be sown in each; let the vessels be placed in exactly similar situations with regard to moisture, light, and air, but let the temperature of the soil in one vessel be raised a few degrees above that in the other: it will be found that the seed in the warm soil will vegetate first, and that the rapidity of the germination of the one over the other will be in proportion to the increase of temperature within certain limits; and to this cause, in a great measure, is to be attributed the rapidity of germination in the tropics, when compared with the temperate or colder portions of the earth.

3d, Although seeds may be placed in a proper temperature, and supplied with sufficient moisture, they do not germinate unless *oxygen* be present.

It has been proved, in the most direct way, that seeds will not germinate under the exhausted receiver of an air-pump, although every circumstance necessary for perfect vegetation be present, with the exception of oxygen; neither will seeds germinate in carbonic acid gas,* or hydrogen, or nitrogen, although vegetation is promoted by chlorine. This last effect arises from the decomposition of a portion of water, the chlorine uniting with the hydrogen, and setting at liberty the oxygen, which is absorbed by the seed.

4th, *Darkness* is found to facilitate healthy vegetation, since seeds vegetate better in the dark than when exposed to the light of day.

Hence, before germination can take place, we must have present, water, a certain degree of heat above the freezing point of water, and also oxygen in a free state, or as it exists in the atmosphere.

The time occupied in germination varies with circumstances; yet if different seeds are subject to precisely the same influences, we find a still more remarkable difference between the period which elapses before they severally germinate.

* When any of the leguminous seeds are allowed to absorb water, and are afterwards placed in a jar of carbonic acid gas, germination does not proceed; but in some days, sulphuretted hydrogen is generated in sufficient quantities to powerfully affect the tests.

The following are the results of some experiments on seeds similarly watered, and exposed to one common temperature. About half the species of the following families germinated after a lapse of the number of days here mentioned, namely—

Days.
10, Cruciferæ.
14, Leguminosæ.
15, Gramineæ and Solaneæ.
23, Umbelliferæ.

The seeds of our commonly cultivated crops are composed of several proximate principles or component parts; those constituting the principal bulk, are starch, gum, sugar, gluten, and albumen. The ultimate principles of the three former are devoid of nitrogen as one of their elements, and consist of carbon, oxygen, and hydrogen; the two latter contain in addition a portion of nitrogen. These constitute the organic portion of the seed; but, besides these organic matters, all seeds contain a portion of inorganic or earthy and saline substances in combination with the organic part.

The alterations which take place in these constituents during the germination of the seed appear, from the best observations, to be the following:—

While the seed remains dry, no change takes place in its texture, but when, under favourable circumstances for vegetating, water is absorbed, the seed swells, and in a longer or shorter period, dependant on the temperature of the air, the germ of the seed is seen to increase in size, and ultimately to burst the cuticle, or seed-covering; the radicle or rootlets descend into the soil in search of food, and to give stability to the growing plant; while the blade turns upwards to develope itself in the air.

While these changes are going on in the appearance of the seed, the proximate principles constituting its substance are also undergoing certain chemical alterations; thus we find that the seed which, before germination, was nearly tasteless, has acquired a sweetness, and is partly soluble in water, (owing to a portion of the starch having been converted into sugar,) and that the gluten and albumen have also undergone an alteration.

That an arrangement like the above has been wisely provided for the supply of the young plant will be readily granted when we consider that the proximate principles of the seed are unfit for the offices they are destined to perform without undergoing a change.

The soluble parts of a seed consist of gum and sugar, and constitute but a very small portion of the whole mass—the remainder is insoluble in cold water—were it not so, the seed crop of the

farmer would be greatly injured by every shower that fell on the field during the formation and ripening of the seed.

The farmer would also find considerable difficulty in preserving his grain for any length of time, so that it might be rendered available as food, or capable of germination when required.

But these uncertainties are provided for in the structure and composition of the seed, which, although insoluble in water before germination, is, by a beautiful process, rendered fully adequate to the wants of the young plant which it is intended to nourish, until sufficiently matured to discharge those offices by which it can supply itself with food from the air, and from the soil in which it is placed. The chemical changes of germination, after the absorption of water by the seed, provided all circumstances are favourable, such as a proper temperature, &c., consist in the absortion of oxygen from the atmosphere. This gas, combining with a portion of the carbon of the starch, is converted into carbonic acid, which is given out into the soil also as gas. This combination produces heat, and appears to be a provision of nature to forward the germination of the seed.

The heat evolved during germination may be observed with advantage in the process of malting: after the grain has imbibed sufficient water, and has lain in a mass for some days, it is found that the temperature increases, and in some instances rises to 100° of Fahrenheit. The increase of heat probably arises from the chemical combination of the carbon of the seed with the oxygen of the air, during germination, this being a process of slow combustion in every respect similar to the combustion of carbon in the air, heat being evolved in proportion to the carbon consumed.

During this absorption of oxygen and evolution of carbonic acid gas, a small quantity of acetic acid is also formed at the expense of a portion of the starch, the acid being excreted into the soil, and probably serves the purpose of a solvent to the earthy matters required by the young plant.

During the time the above changes are taking place, an alteration has also commenced in the gluten and albumen of the seed of an important and necessary character, since the starch, being insoluble in cold water, would, without an alteration, be quite incapable of finding its way into the vessels of the embryo plant, or of supplying it with the nutriment required.

This change consists in the conversion of a portion of the gluten and albumen into a substance called diastase, which is first formed at the base of the germ, and its function is to convert the starch first into a species of gum and then into sugar, which, being soluble in water, can readily be conveyed through the sap vessels of the young plant. It is the action of diastase

on the starch of the grain in malting that converts it into a saccharine matter capable of undergoing fermentation.

As soon as the plant has sufficiently developed itself as to be enabled to obtain from the soil and the atmosphere those substances necessary for its growth, its organs commence the performance of their several functions. Thus we find the office of the root to consist in—

1*st*, Giving a firm attachment to the ground.

2*d*, In the absorption of water from the earth by the plant. This is dependant on the nature of the soil, the heat and humidity of the atmosphere, and the extent and structure of the foliage of the plant, some leaves giving off more moisture than others.

3*d*, The absorption from the soil of mineral and gaseous substances. These latter are, for the most part, taken up in solution in water, and consist of carbonic acid and oxygen.

These gases are continually being removed from the soil in solution in water, by the spongioles of the roots of plants, and are necessary to healthy vegetation, since, if the roots of plants are deprived of these gases, they languish and die.

Hence the necessity of all soils being sufficiently pervious to admit a constant renewal of air about the roots.

All plants, and particularly those cultivated for their seed as food, require nitrogen, without which they are incapable of perfecting their seed. Although nitrogen exists abundantly as a constituent of our atmosphere, yet we have no proof of its being assimilated by plants in its free state; and we are indebted to the labours of Professor Liebig for an explanation of the manner by which it is obtained by the growing plant.

Liebig has shewn that ammonia constantly exists in the atmosphere in small and variable quantities, and, being soluble in water, is brought down by every shower, and carried into the soil. On reaching the roots, it is absorbed by the spongioles, and carried into the plant, where, under the influence of light, heat, and vitality, it undergoes decomposition, and is rendered subservient to vegetation. Sulphuretted hydrogen, a gaseous compound given off from heaps of decaying vegetable and animal matter, is the cause of the nauseous odour exhaled by some plants during decomposition, particularly by those belonging to the order Cruciferæ. It is also extensively generated where water containing the sulphates in solution has access to vegetable matter in a state of decay, as at the mouths of some rivers, where sea-water finds its way into marshy and alluvial flats when vegetable matter is undergoing decomposition.

That sulphuretted hydrogen exists in the air above such localities may be proved by suspending a piece of pure silver for a

few days near them, when it will be covered with a thin crust of sulphuret of silver, varying in tint from a pale yellow to a brown or black, according to the amount of sulphur that has entered into combination with the silver. Metallic copper is even a more delicate test for the presence of this gas than silver, its polished surface being rapidly converted into a sulphuret of copper.

The presence of this gas in the atmosphere is, in all probability, the cause of the strong smell of sulphureous acid noticed after a flash of lightning, the electric fluid causing the decomposition of the sulphuretted hydrogen.

According to the experiments of Saussure, 100 cubic inches of water will absorb 253 volumes of sulphuretted hydrogen.

Hence it must be, like ammonia and carbonic acid, frequently brought down by the rain and placed within the reach of the roots of plants; and, no doubt, a portion of the sulphur found in vegetables is derived from this source, or taken in by the leaves, and then decomposed, as the following experiment will prove:—One drahm of mustard seed (*Sinapis alba*) was sown in soil placed in a porcelain basin; when the seed had fairly vegetated, the basin and its contents were placed under a bell glass containing 200 cubic inches of atmosphericair—contact with the external air being cut off by placing the edge of the glass in a groove filled with oil—a sufficient quantity of sulphuretted hydrogen was passed into the glass to stain a slip of paper, moistened with a solution of subacetate of lead of a rich brown. In the space of one minute, the paper being removed, the glass was placed with its contents in an open space subject to the action of the sun. On the following morning, on introducing a slip of paper moistened with solution of lead, and allowing it to remain half an hour, no trace of colour appeared; the glass cover was then removed, the plants examined, and the glass replaced, with a fresh portion of gas added, until the brown tint was obtained with the test of lead. This experiment was carried on for the space of a week, and every day with the same results—the plants remaining healthy, and growing rapidly during the whole time. That the gas was absorbed and decomposed by the plants, I think can hardly admit of a doubt, since only a trace of it was to be detected in a portion of moisture which condensed in the glass, and the arrangements were such as entirely to cut off any communication with the external air during the disappearance of the gas.

4th, The absorption of the mineral constituents found in the ashes of plants takes place from the soil and in solution in water. It has been shewn by physiologists, in the most satisfactory manner, that the roots of plants have no power to take into their texture solid mineral matter, the spongioles of the roots being

formed of so delicate a substance that they totally resist the entrance of all matters except in solution in water, and it is by this means that plants acquire the various earthy and saline matters found in their texture, and which are necessary to their healthy vegetation.

We have, on the authority of Sprengel and other continental chemists, elaborate analyses of the ashes of cultivated crops, proving that plants require a number of different inorganic or earthy ingredients as food, and that these earthy and saline substances are obtained wholly from the soil in which the plant grows, and must exist in it, or be added to it artificially, before the plant can perfect itself. Hence we find that land which has been long under cultivation, and when the crops have been removed, bearing with them their earthy and saline ingredients, is incapable of producing so luxuriant a crop as newly broken up ground, where these earthy and saline matters exist in abundance, and in a fit state to be acted on by water and carbonic acid for the supply of food to the plant.

Having briefly noticed the various changes occurring in the seed during germination, and the office performed by the root, we shall be better prepared to understand what would constitute the "best admixture of the ordinary elements of soil for promoting the germination and growth of particular vegetables;" and in doing this, the first thing that offers itself to our attention is the fact that the soil should contain, in a fit state to be acted on by water and carbonic acid, *all the earthy and saline constituents necessary as food for the plant destined to be grown thereon*, so that they may be taken up by the roots and carried into the texture of the plant.

We have, on the authority of Professor Sprengel and other celebrated chemists, the analyses of the ashes of the crops usually cultivated, shewing that large quantities of earthy and saline substances are actually required by the plant, and which always enter into its composition whenever it is to be obtained from the soil. That this is not the result of chance is evident, since the composition of the ashes of the same variety of plants is usually the same on whatever geological formation they are grown. This difference is observed to be greater in plants whose natural affinities are the most unlike.

In the following table I have given the composition of the ashes of plants usually cultivated, from the work of Sprengel:—

100,000 *parts of the following Crops contain of Inorganic Substances:—*

Substances.	Wheat.		Barley.		Oats.		Rye.		Pease.		Beans.		Beet.		Carrot.		Swedes	Lucern.	Sain-foin.	Red Clover.	White Clover.	Rye Grass.
	grain.	straw.	grain.	straw.	grain.	straw.	grain.	straw.	grain.	straw.	grain.	straw.	root.	leaves.	root.	leaves.						
	1777	3518	2349	5242	2580	5740	1040	2793	2464	4971	2136	3121	5986	15439	5090	10420	7046	2580	1671	1571	1735	1693
Consisting of the following Substances:—																						
Potash, . . .	225	20	278	180	150	870	532	32	810	235	415	1656	1481	5^{6}00	2718	3236	2651	362	494	419	590	282
Soda, . . .	240	29	290	48	132	2		11	739	...	816	50	3178	3290	709	921	1164	166	105	111	110	126
Lime, . . .	96	240	106	554	86	152	122	178	58	2730	165	624	285	2316	505	3050	835	1304	527	584	446	236
Magnesia, . .	690	32	180	76	67	22	44	12	136	342	158	209	139	839	295	398	282	94	69	70	58	29
Alumina, . .	26	90	25	14	14	6	24	25	20	60	34	10	20	130	30	78	40	8	16	3	36	10
Oxide of Iron,	...	...	trace.	20	40	2	42		10	20	...	7	58	50	25	15	35	8	...	traces	12	traces
Oxide of Manganese, .	...	...	...	146	...	2	34	...	...	7	...	5	50	60	46	...	...	...	...	traces	...	...
Silica, . . .	400	2870	1182	3856	1976	4588	164	2297	410	996	126	220	105	425	105	454	475	90	120	76	280	887
Sulphuric Acid,	50	37	59	118	35	79	23	170	53	337	89	34	123	975	208	1082	890	109	82	94	67	113
Phosphoric Acid,	40	170	210	160	70	12	46	51	190	240	292	226	167	690	395	963	408	353	220	138	96	8
Chlorine, . .	10	30	19	70	10	5	9	17	38	4	41	80	380	1064	54	223	266	86	38	76	40	2

The above were air dried. (Wheat to Swedes)

In the green state. (Lucern to Rye Grass)

We have seen that, when a seed is cast into the soil, before germination can take place it is necessary that water should be absorbed, and that air should have access to the seed.

Hence the composition of a fertile soil should be such as to secure the fulfilment of both these circumstances.

The office performed by alumina, or the pure earth of clay, appears to be that of absorbing and retaining water, for which it has a great affinity, yet it readily parts with moisture to the seed. It has also the power of absorbing into its pores* ammonia and other gases, both from the air and decomposing vegetable and animal substances in the soil, and these gases perform an important part in the nutrition of vegetables; yet if alumina exist in too great a quantity, it is injurious to vegetation, forming a soil of so stiff and tenacious a nature, that its pores are either filled with water during a rainy season, or become so hard and compact after a drought, that air cannot gain access to the roots, neither can the necessary changes go on in the animal and vegetable matters existing in the soil. Hence an imperfect vegetation is the consequence.†

But we find in all fertile soils that by far the larger portion consists of grains differing in size from fine sand to gravel, and consisting of broken fragments of rocks, silex, &c. These grains act mechanically by keeping the soil open and porous. Hence they are absolutely necessary as a component part of a fertile soil, since, without such grains, the air would not be able to find its way to the roots of plants; the admission of air also promotes the decomposition of the vegetable and animal matter in the soil, by which carbonic acid and ammonia are supplied to the roots; and rain, by this means, is enabled to find its way downwards, carrying with it those gaseous substances dissolved in its course through the atmosphere.

Carbonate of lime is a third constituent always existing in a fertile soil, and in some in abundance; it has the power of

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* Equal weights of clay, humus, (decayed sawdust) siliceous sand, calcareous sand, and carbonate of lime, were dried at the same heat, and exposed for the space of an hour to the action of ammoniacal gas. They were then exposed to the air for twenty-four hours, when they were examined and found to have retained ammonia in the following order :—Clay, the largest quantity; humus, next in order; carbonate of lime (in powder) traces; siliceous and calcareous sand, not a trace.

† To ascertain how far the seeds of wheat had the power of vegetating, if planted in a very stiff soil, the following experiment was tried :—

A number of balls, half an inch in diameter, were made of very stiff subsoil clay, such as is used in the manufactory of flowerpots; these were divided, and in the centre of each a grain of wheat was placed, and the clay again firmly closed. These balls and their contents were planted in a porous soil, and kept moist with water, but no vegetation ensued, the clay being perfectly impervious to air. Hence it is probable much seed perishes when planted in stiff clay soils, especially if such soils be exposed to any cause capable of rendering it compact after the seed is sown.

absorbing moisture from the atmosphere, but not to the extent possessed by alumina; it, when in an impalpable powder, also condenses some of the gases, and is soluble in water holding carbonic acid in solution; and in this manner it finds its way into the texture of plants by the roots, and forms a constituent of their ashes. When added as quicklime, it hastens the decay of the vegetable and animal matters in the soil, rendering them more immediately useful to the succeeding crop; and in this state, or when added in the state of chalk or marl to soil devoid of lime, it has a highly beneficial effect.

Magnesia, a constituent of most crops, is found in all fertile soils, but generally in much less quantities than lime. Like lime, it is soluble in water holding carbonic acid in solution, and in this state it enters into the texture of plants; and it has the power of absorbing and retaining moisture, but with less tenacity than alumina.

Iron, as an oxide, constitutes with organic matter the colour of most soils; it is found, with manganese, in the ashes of most plants; as an oxide, it has the power of absorbing from the atmosphere ammonia, which it yields to the plant. It frequently exists in combination with sulphur, as a sulphuret, and is then injurious when near the surface, the action of air and water changing the sulphuret into a sulphate; but if the soil contains lime, another and a salutary change occurs, the sulphuric acid of the sulphate quits the iron to unite with the lime, forming sulphate of lime, or gypsum, the iron being left as an oxide. Hence the great improvement noticed in such soils after the application of lime, particularly if they are thoroughly drained.

Potash and soda exist in the ashes of most plants, the former preponderating in land plants, and the latter in those of the sea-coast; these alkalis are supplied, by the soil and by manures, to land plants, and are partly obtained from the sea by those growing near the coast; and they form a component part of many minerals which enter into the composition of soils, and which, when disintegrated, supply alkalis to the crops. The following minerals are capable of yielding to a soil:—

Name of Mineral.	Per cent of Alkali.	Name of Alkali.
Felspar	17.75.	Potash
Albite	11.43.	Soda
Mica	3. to 5.	Soda
Zeolite	13. to 16.	Soda and Potash
Basalt	5.75. to 10.	Soda and Potash
Clay-slate	2.75. to 3.31.	Potash
Clinkstone	14.	Potash

The action of these alkalis is of considerable importance in the soil, for without a certain amount of alkali plants could not

acquire silica, the latter being in itself totally insoluble in water; but when chemically associated with potash or soda it becomes soluble, and thus enters into and supplies the plant with silica sufficient to give strength to the stems of grass, wheat, &c. The alkalis also modify the decomposition of the vegetable and animal matters in the soil, forming, with some of the products of decay, soluble salts, such as the nitrates of potash and soda, which are formed when vegetable and animal matter undergoes decomposition in contact with air and in presence of these alkalis, the nitrogen of the decaying substances, at the instant of liberation, uniting with the oxygen of the air and forming nitric acid, which immediately unites with the alkalis or alkaline earths in the compost or soil, forming nitrates of their basis. In this state, as nitrates, they are absorbed and carried into the texture of the plant and there decomposed, the nitrogen being appropriated in the formation of gluten and vegetable albumen, while the alkali enters into new combinations, or is excreted from the roots. Hence the nitrates constitute another source of nitrogen for the plant, as has been shewn by the analysis of samples of wheat grown with nitrates of potash or soda used as a manure, when compared with that grown without them on the same field, the gluten and vegetable albumen in the nitrated wheat being larger than in the unnitrated sample.*

Sulphuric acid, as a constituent of soil, is usually found in combination with lime, as gypsum or sulphate of lime; it is also combined occasionally with the saline matters, as sulphate of potash or soda. This acid enters into the composition of all soils capable of bringing a crop to perfection. It is found abundantly in the ashes of leguminous crops, Swedes, beet, &c.

Chlorine exists in small quantities in the ashes of most plants. It is usually in combination with soda, as common salt, in the soil, and is detected in greater abundance in situations near the sea-coast, where it is continually being supplied by the spray of the sea, which is carried by the wind, during stormy weather, to great distances inland.

Phosphoric acid, or the acid of the earth of bones, exists in all cultivated crops in combination with lime and magnesia. It is found in abundance in grain, turnips, wheat, &c. All soils capable of producing good crops contain phosphoric acid; and where it is deficient, great benefit has been derived by adding it artificially, as in the application of bones.

Besides the foregoing earthy and saline matters, all soils, to be fertile, must contain a certain amount of vegetable and animal matter in a state of decomposition. The vegetable matter, or

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* Mr Hyett's Experiments in the Royal English Agricultural Journal.

humus of a soil, as it is acted on by air and moisture, slowly evolves carbonic acid, which, being dissolved in water, acts on the several inorganic constituents in the soil, and, dissolving a portion, is carried into the texture of the plant together, the carbonic acid undergoing decomposition in the leaves and stem under the influence of the sun's rays. But, independent of the supply of organic matter to the plant, humus has a mechanical action, namely, that of keeping stiff soils open and porous. It also has a great affinity for water, and possesses the power of absorbing from the soil and air many gaseous and liquid substances, and condensing them in its pores.

The animal matter in the soil also supplies carbonic acid, ammonia, and sometimes nitric acid. These substances form in the soil compounds which are absorbed by the roots of plants, and minister to their growth and luxuriance, the nitrogen assisting in the formation of gluten and albumen, while the carbon is appropriated to the formation of gum, starch, or woody fibre.

The colour of a soil is not without its influence on germination; since we find that dark-coloured soils are capable of absorbing more of the heating rays of the sun than those of a paler colour, and of conveying this heat to some little depth below the surface.

Moisture considerably influences the time of germination of seed and the growth of the future plant. If a soil is of so compact a nature as to retain a large amount of water, the temperature of such soil will be lower than if dry, and vegetation will be retarded in proportion, considerable heat being expended in converting the water into vapour before the soil derives any increase of temperature from the sun's rays; or if an open soil lies on an impervious subsoil, water will be brought up by capillary attraction and dissipated in the air. Hence such soils will be colder than soils of a more open texture lying on a pervious or thoroughly drained subsoil, and germination will, of course, be later.

Those plants which have a loose and spongy texture, and large and soft leaves, require more water than those that are firm and succulent in their structure, the latter being enabled to extract a large portion of moisture from the atmosphere.*

Elevation above the level of the sea has considerable influence on the time required to perfect a crop, every 2,000 feet elevation being equivalent to about 7° F. in summer, or every foot altitude on a mountain side is equivalent, in difference of temperature, to

* The evaporation from the Mediterranean alone, on every hot summer's day, sends into the atmosphere 500,000,000 tons of water. The Mediterranean occupies only 140th part of the entire surface of the ocean. We may suppose the total evaporation from the ocean to amount to little less than the enormous sum of 75,000,000,000 of tons every day.

about three miles, or more nearly three minutes of a degree in latitude, and, therefore, twenty feet are equal to a whole degree; and when one once arrives at the mean temperature of London, 400 feet more of elevation will bring one to the climate of Lapland.*

Aspect has also it share in modifying the time required to perfect a crop, since land exposed to the north or north-east will receive and absorb less of the heating rays of the sun than lands exposed to the south or south-east, and hence vegetation will be accelerated or retarded in proportion.

We have seen that many circumstances are necessary to perfect germination and growth; thus we should have the soil capable of admitting air into its texture, that it should have the power of absorbing moisture from the air, and that its temperature should be above the freezing point of water—that, as vegetation proceeds, the plant requires those substances capable of supplying it with a due proportion of organic and inorganic food, and that this food should be in such a state as to be readily acted on by water and carbonic acid—that germination, and the future growth of the plant, is influenced by elevation above the level of the sea, by colour of the soil, by aspect, and by water in the soil and subsoil. These circumstances are again modified by the mechanical operations carried on and in the soil, such as mode of culture, &c. The following analyses of fertile soils, from the work of Sprengel, will shew the chemical constitution necessary:—

	1.	2.	3.
Silica and fine Sand,	84,543	92,980	84,021
Alumina,	3,458	820	4,498
Oxide of Iron,	3,488	1,666	5,120
Oxide of Manganese,	560	188	2,080
Lime,	319	748	942
Magnesia,	740	168	1,740
Potash,	traces.	65	50
Soda,	6,004	130	12
Phosphoric Acid,	260	246	482
Sulphuric Acid,	8	traces.	12
Chlorine,	8	traces.	8
Humic Acid,	416	764	897
Humus containing Nitrogen,	196	2,225	138
	100,000	100,000	100,000

The following, taken from the work of Schubler, are the proportions of clay, lime, humus, and sand, which constitute soils capable of giving the best return of the respective crops.

* Mudie's World.

Proportions in every 100 parts of a soil :—

Clay.	Lime.	Humus.	Sand.	
Above 50	0.5 to 5.0	1.5 to 5.	The remainder.	No. 1.
... 50	5. ... 20.	1.5 ... 5.	...	
... 50	Above 20.	Above 5.	...	
30 to 50	0.5 to 5.	1.5 to 5.	...	No. 2.
20 ... 30	Above 20.	1.5 ... 5.	...	
20 ... 30	5. to 20.	Above 5.	...	
20 ... 30	5. ... 20.	1.5 to 5.	...	
10 to 20	0.5 to 5.	1.5 to 5.	...	No. 3.
10 ... 20	5. ... 20.	1.5 to 5,	...	
10 ... 30	5. ... 20.	Above 5.	...	

Soils having a composition similar to No. 1 give excellent returns of wheat, barley, beans, and clover. Those of No. 2 are best suited for barley, rye, oats, clover, and turnips. No. 3 are capable of producing good crops of oats, rye, and potatoes, but are unfit for wheat, &c.

The above mixtures of clay, lime, humus, and sand, are such as will suit the several varieties of plants enumerated; but the proportions of the several ingredients must be altered according to circumstances, a larger portion of sand being required in situations where rain falls often and in large quantities, but in drier situations clay may predominate. When we consider the great difference in the quantity of rain falling annually in different parts of our island,* it would be impossible to give any definite mixture to suit all situations; and, if it could be accomplished, few persons would be able to obtain such a mixture; but the following experiments from Schubler's work will shew the power of absorption of moisture from the air possessed by some of the ordinary constituents of soil, which were spread over a surface of fifty-six square inches. The temperature of the atmosphere in which they were exposed was between 59° and 65°.

* The following is the quantity of rain that fell in inches, at the under-mentioned places, during the year 1841 :—

South Lambeth.	Bristol Institution.	Radstock, 8' S. of Bath.	Thetford.	Nottingham, Lat. 51d. 7m. 8s. N. Long. 1d. 8m. 14s. W.	High Wycombe, Lat. 51d. 37m. 44s. N. Long. 34m. 45s. W.	Salisbury.	Gosport.
27.18	37.69	44.378	21.66	18.285	38.171	39.915	37.480

The amount absorbed is stated in grains.

1000 Grains.	12 Hours.	24 Hours.	48 Hours.	72 Hours.
Siliceous Sand,	0	0	0	0
Calcareous Sand,	2	3	3	3
Gypsum,	1	1	1	1
Sandy Clay,	21	26	28	28
Loamy Clay,	25	30	34	35
Stiff Clay,	30	36	40	41
Grey pure Clay,	37	42	48	49
Fine Lime,	26	31	35	35
Fine Magnesia,	69	76	80	82

The following are analyses made last year of fertile and good corn-growing soils, situated from twenty to sixty feet above the level of the sea; the average quantity of rain falling being thirty-one inches, the mean temperature 50°. The subsoils are drained.

	1.	2.	3.	4.	5.	6.
Water of absorption,	7.00	10.00	10.00	4.80	7.50	11.50
Sand and Gravel,	69.43	34.00	41.20	60.21	32.15	69.50
Silex (fine),	7.00	24.50	25.50	29.60		
Alumina,	5.50	11.50	12.00	4.00	5.00	9.50
Oxide of Iron,	4.70	4.50	1.25	.40	1.00	1.20
Carbonate of Lime,	2.20	6.70	1.10	.60	1.60	3.60
Carbonate of Magnesia,	traces	.10	.90	.25	traces	
Saline matter, consisting of Sulphates and Chlorides,	0.17	.15	.10	.14	.15	.10
Gypsum,	0.10	traces	.12	.14	.2	traces
Phosphate of Lime,	0.20	.15	.18	.5	.50	.15
Organic matter,	3.70	8.40	4.00	2.60	2.40	4.00

Nos. 2, 3, and 6, are strong clays containing sufficient sand and gravel to keep them porous, and giving excellent returns of wheat and beans. The others give good crops of barley, wheat, clover, turnips, and pease.

ON SHELTER FOR SHEEP.

By Mr James Purves, Thurdistoft, Caithness.

I have found, after several years' experience, that the best mode of wintering half-bred or Leicester hoggs and lambing ewes on smooth ground, where the climate is indifferent, is to have sheds with large yards attached to them.

My practice has been, when the weather breaks up for the

winter, to lay plenty of straw in the sheds, and to fill the racks with hay or oat straw, to put the hoggs into all night. As long as their teeth remain good, and storms keep off, to give them turnips all day on a grass field, or to net them on the turnips, as the state of the land suits. Whenever their teeth fail, to fill the turnip-house, cut the turnips, and give them in troughs in the yard. One man and a boy will easily cut for 300 hoggs a-day. After the middle of March, hay should be solely used, at the rate of $\frac{3}{4}$lb per day for each sheep. When the day is good at this season, to allow them to go out to a grass-field for a short time; but when spring sets in, to confine them altogether, as when sheep get a bite of grass it puts them from feeding in the courts.

If the weather sets in dry about the middle of March, it is well sometimes to put them out on the turnip land altogether, and keep them there till such time as the turnips should be removed; when they are again put into the yards, and kept in them till the turnips are done and the grass affords a full bite. By this mode of management the stock are always comfortable, and have plenty of food, and there is no waste of turnips by frost or storm; and it saves the poaching of the turnip or grass land. By always having a month's turnips stored, the sheep do not suffer from frosted turnips; and the quantity of manure made in this manner is very great, and its quality excellent.

The same sort of sheds may be used for lambing ewes, keeping them either on the turnip field, or have turnips laid upon a grass field near the shed during the day, and fold them during the night. The shepherd has a room at the end of the sheds, or in the turnip-house, where he and his assistant remain all night, one watching while the other sleeps.

By this mode of feeding it is quite easy to have hoggs fit for market before the grass is ready, by giving each, for two months, one pound of oats or oil-cake daily, along with their turnips and hay. From the experience I have had, I do not say that sheep are better off in sheds than in the open air, where the climate is fine, the situation dry and well sheltered, except in a snow-storm or in very wet weather; but, taking average situations into account, more especially in such districts as Caithness, where the climate is variable and the soil damp, and where there is little or no natural or artificial shelter, there is no doubt of the utility of the plan; and its general introduction and uniform success in that county are its best recommendations. I also hold it impossible to lamb ewes safely in such situations without such a plan being adopted. This system also, in a great measure, dispenses with the necessity of keeping a large number of cattle to trample down the straw on arable farms; and as sheep are decidedly a more profitable stock than cattle, and managed at less expense,

their numbers can be, in this way, considerably increased, especially if bone manure be used and furrow-draining persevered in.

The expense of keep in this way is much the same as in the fields. There is, however, less loss of turnip, and the manure is better preserved, and its value will more than compensate for the carting of it to the land. When oil-cake or oats are given, the difference of expense will be amply repaid in the superior quality of the wool and mutton, and in getting the sheep early to market, and in saving the grass for other stock.

A shed of 100 feet in length and 14 feet in width, having a back wall 6 feet high, of dry stone harled with lime, and pillars in front, of stone and lime, with small trees laid across the shed for joists, covered with branches, and thatched with a stack of straw; together with a court, fronting to the south, of 100 feet square, fenced on the east and west sides with a dry stone dyke 6 feet high, and in front with a 4 feet wall, and all coped with turf, will contain 300 hoggs. A turnip house of 40 feet in length and 15 feet in width should be constructed at one end of the shed, stretching along one of the side walls of the court; and an apartment for the shepherd should be made at the end of the house, 12 feet long and 15 feet in breadth.

Machines for cutting turnips are now made well everywhere. The feeding troughs, 12 feet long, in two divisions, 12 inches wide at top, inside, 9 inches deep, and 4 inches wide at the bottom, should have a rail placed along their length, to prevent the sheep getting into or over them. The usual mode of placing the hay racks, at 45° of angle from the wall, throws the grass seeds into the wool. A much better plan is to place the racks parallel with the wall, and if a cope of flag, projecting 2 feet, be placed upon the wall, it will keep much of the rain from the racks.

In Highland districts, where food and shelter in winter are difficult to be obtained, the only remedy is plantations, stells, and the sowing of whin and broom hedges. The best form of stell I know is a circular wall of stone and turf, 50 feet in diameter, having a projecting wall, 40 feet in length, to the north, east, and west, of 6 feet in height, made 3 feet of stones and 3 feet of turf. A plan of sowing a whin hedge, which answers very well, is to raise a mound of earth, with a ditch on each side, upon the top of which whin or broom seed is sown, and a dead hedge formed of brush-wood. The dead-hedge forms an immediate fence of itself, and it will fence the young whin plants till they become sufficiently strong to resist the teeth of the sheep. Whin and broom seed may be sown together, but I prefer to sow them separately.

ON THE EFFECT OF CERTAIN PLANTS ON BUTTER.

By Sir George S. Mackenzie of Coull, Bart.

When I came to Beechwood, near Edinburgh, in May 1841, I purchased two Ayrshire cows, which gave me abundance of milk, apparently of good quality. Being in the habit of taking milk at breakfast, and having been always accustomed to have it of the first quality, I should have detected even a very slight taint in the milk of these cows. The cream was also unexceptionable. But when it came to be churned, the butter was imperfectly formed, of a dirty-white colour, and the taste so peculiarly bad as to render it unfit for use. I examined every utensil, had them scrubbed with hot water, and did everything to satisfy myself that the source of the evil could be nowhere but in the pasture, and that something had been eaten by the cows, the baneful effects of which were evolved during the chemical changes taking place in the process of churning. I found, on inquiry, that this effect was nothing new, and that old pastures not far off produced butter equally bad. Not being a botanist, I could distinguish no plant in the field to which I could refer the mischief, except the tuberous rooted ranunculus; for the common butter-cup I have seen abounding where no such effect on the butter was known. My only reason for suspecting the ranunculus is, that, after it had seeded and ceased growing, the butter was better. Last summer my cows were on a piece of new grass, and I had sheep on the rest of the pasture. I also spread nitrate of soda on the surface, but do not suppose that would destroy the noxious plant.

As, from the fact now stated, it appears that certain plants injure the quality of butter, so it appears certain, from the varying qualities of butter in different districts, there may be plants better adapted for dairy pastures than others; and this appears to be a subject worthy of the attention of agriculturists. To discover the best plants for dairy pasture may be a good subject for experiment. I have known the purest quality of butter derived from very old pastures, in which a variety of the *Agrostis* was very abundant, not the *stolonifera* or *Fiorin;* but if the latter be also favourable to the quality of butter, it may again come into notice. The object in the management of pastures has, for many years, been to have in them a succession of grasses, so that at all seasons something succulent might be found. But no attention has been paid to the effects of particular grasses on dairy produce; and I believe I may say the same thing with regard to fattening beasts. Observations have been made on the grasses most acceptable to sheep, and it might be worth while to collect them. Cattle appear to be less discriminating than sheep, nevertheless, it may be of importance to study their palates also.

DESCRIPTION OF A FLOATING GUARD OR FENDER FOR THE ABUTMENT PIERS OF BRIDGES.

Communicated by the Rev. George Morison, Banchory-Devenick.

The danger to the banks of rivers and to bridges built across them where there exists a practice of floating timber on such rivers when in high flood, is too well known to require being enlarged upon. It is of more importance to keep in view that (excepting whilst bridges are being constructed and not yet finished) no legal provision exists to enable the sufferer to recover damages. Under such circumstances it seems an object of no small importance to devise means for preventing that mischief for which no redress can be obtained, and this communication is made for the purpose of bringing into notice an ingenious contrivance adapted for the attainment of this desirable security.

The parish of Banchory-Devenick, of which I am minister, is situated partly in Aberdeenshire and partly in Kincardineshire, the river Dee passing through it, and forming the southern boundary of the one county and the northern boundary of the other, the church, manse, and school, standing on the Kincardineshire side. To obviate the inconvenience occasioned by this state of things to the residenters on the Aberdeenshire side of the river, I erected, about seven years ago, a bridge, on the suspension principle, for foot passengers. The span of the main arch, or horizontal distance between the two main pillars, is 183 feet, and the width of roadway 5 feet, but the entire length of the bridge, as seen in the accompanying plate, is 383 feet, and the breadth of the river, when in flood, occupies the entire length of this. From these circumstances it follows that the main piers are at these times involved in the current of the river, and, by the accumulation of large trees that are floated down the river singly, the bridge has been in jeopardy during every flood that has occurred since its erection. Owing also to the local formation of the river's banks, and from the position of the little islet shewn in the plan, though that is covered in time of floods, the weight of the current is thrown upon the northern bank, and the accumulation takes place about the main pier on that side. To prevent this accumulation, various plans have been suggested and abandoned on account of their expense, their doubtful success, and, above all, their being useful only in certain states of the river. Amongst the many suggestions, I was much pleased with one by Mr George Barclay, carpenter, residing in the neighbourhood. This appeared to possess all the conditions requisite to render the scheme effective in all states of

the river, and would present itself always at or near the surface of the water, where alone its resistance could be required, to meet the floating timber. The plan appeared to be ingenious, while its principles were simple and intelligible. I was therefore induced immediately to order the construction of a guard or fender agreeably to the proposed plan, which was forthwith completed. Since the time of its erection there has occurred but one high flood in the river, when its operation was carefully observed, and I had the satisfaction to find that it answered my most sanguine expectations.

During that flood, out of 203 trees which came in contact with the fender, 201 were thrown off into the more rapid part of the stream, 2 only having passed under it, and in future even this small escape will be prevented, by a simple contrivance of the inventor, which will be pointed out in the accompanying figure and description.

By reference to the accompanying plate, wherein Fig. 1 is an elevation of the bridge somewhat curtailed at the left hand side, two small arches of 20 feet each being cut off in the figure. Here *h* and *c* are the two main piers before alluded to. Fig. 2 is a plan of the bridge, with a small portion of the river and its banks; here again *h* and *c* are the main piers, *a* the small islet, but covered in high floods, and from its position in connexion with the adjacent banks, together with the effect of the deep channel, as seen in Fig. 1, has the tendency of throwing the weight of the current and all floating bodies towards the left bank of the river and upon the pier *c*; hence the necessity of the guard or fender on that side only, to defend this pier.

The principle of the fender is that of a floating wier placed obliquely to the stream, and which, from its construction, admits the stream to pass under it instead of over, while floating bodies, by impinging against it at an obtuse angle, will be either thrown off, or led along the edge of the wier till they have passed the object that is to be defended. In Fig. 2, *c e d b* represents the fender in its oblique position; its length from the pier, *c* to *b*, is 88 feet, from *b* onward to *f* being a permanent close paling in continuation, to prevent trees from passing behind the fender. It may here be remarked that a continuation of this paling, or a retaining wall of stone continued on to the pier, might be conceived to make a more certain defence; but, by looking at the section of the river, Fig. 1, it will be evident that such a measure would form a very important and detrimental reduction of the waterway of the bridge, as it would throw into the main current all the water that passes in time of floods, through the opening, *c l*; such a measure, therefore, would be altogether inadmissible.

The costruction of the fender is that of a simple beam in three lengths or compartments, it is 14 inches in depth and 11 inches broad,

and is attached at the higher extremity, *b*, Fig. 4, by a movable connexion, to a strong post, the compartments of which the fender is formed being hinge-jointed to each other at *d* and *e*, the joint moving only in the vertical direction. To prevent swerving of the fender when afloat, it is guided in its vertical movements by two stays, *d r* and *e r*, Fig. 3; these are light spars, 4 inches diameter, attached by hook-and-eye joints to posts, *r r*, at the one end, and at the other in like manner to the fender, the joints, *r r*, being situated about mid-height between the level of the lowest water and that of the highest flood. In Fig. 3 the fender is seen in plan with all its pertinents, and on a larger scale; but here the guidestays are broken off in the middle, while Fig. 4 exhibits it in elevation. In these two figures the same letters mark the corresponding parts. In Fig. 4, *a* is the post to which the head of the fender is attached; it inclines slightly from the perpendicular, and is supported by the backstay, *o*. The head of the fender is furnished with an iron frame, carrying three friction-rollers, embracing the post, and these cause it to rise and fall with freedom as the state of the river requires, and, at the same time, by means of the post, serves as an anchor to retain the fender in its place.

The head thus completed, as well as the intermediate joints, *d* and *e*, and also the extreme end *c*, the fender, is brought to rest, when the river is low, upon a pillar of stone at each of these points, that at *c* being about the level of summer water, the end, *b*, at the height of 3½ feet above that level, and the intermediate bearings are arranged to bring the fender to a straight line or thereby, as represented by the dotted lines in Fig. 4. In place of stone pillars for these bearers, the object is attained equally well by means of two posts and cross head at each station, and this form is represented in the figures. The fender is furnished, besides, at the extremity, *c*, with two rollers that run vertically, bearing upon the main pier, *i*, Figs. 3 and 4, serving to make the rise and fall of the fender upon the pier smooth and easy.

The effect of these arrangements will be easily understood, and may be described thus:—When the river is in summer water, the fender rests on its bearers in the position of the dotted lines, Fig. 4. In the event of a flood in the river, when it begins to rise, the compartment *e c* of the fender becomes gradually afloat, and when the flood has risen to the height of the bearer at *e*, the second compartment, *d e*, also begins to float. The flood still rising, and having reached the bearer at *d*, the upper compartment begins also to float; and if the flood reach a greater height than the bearer at *b*, the head of the fender rises upon and is guided by the head-post, the whole being now uniformly buoyed up to any height that the river may rise. The oblique position will be still preserved laterally by means of the stay-bars, *d r* and *e r*, and the lower end, *c*, by the pressure of the current will be

always bearing against the pier. On the fall of the flood, the converse of this process takes place, until the fender again settles upon the bearers in its state of rest.

In order to prevent the escape of trees under the fender, a rib or keel has been attached to its lower side, forming an obtuse angle with the exposed face of the fender beams. Fig. 5 *a* represents a cross section of the fender beams on an enlarged scale, with the additional appendage, *b*, which, from its position, will bear up any log or tree on its first impact, and, by preventing its passage under the fender, will send it off into mid-stream. In this figure, also, *r* is a portion of one of the guide-stays, with the eye-bolts by which it is jointed to the beam; but since the application of the keel-pieces, the eye-bolts have required to be placed more towards the bottom of the beam.

It is proper to observe here that a fender on this principle can only be applicable in particular localities and under particular circumstances. For example, it can only be applied with advantage to those piers of a bridge between which the main current of the river runs, and having side passages for flood waters, as in the case here represented. If we suppose this bridge to have been so constructed as to have had one pier in the middle of the river and an abutment at each side, as *k* and *l*, Fig. 1, such a fender could not with propriety be applied to the middle pier, nor would it be required at the abutments; but such a case seldom if ever occurs; for, as it places the middle pier in deep water, the difficulty and expense of erection is much increased. In the case of a bridge with numerous piers, this fender can always be applied with advantage to the first pier from either abutment, and were it found necessary for any intermediate pier, standing in shallow water, a double fender on this principle, slanting right and left, might be advantageously applied. For any bridge constructed as the figure represents, and subject to floating timber, a defence more simple and effective than this self-acting guard or fender could hardly be devised.

Note by Mr Slight.—Bridges of any description are important objects in many points of view, but as objects of utility they are of paramount importance. The position of the one now before us is a striking example of the useful, as forming the connecting link betwixt the severed portions of a parish, and the formation of such a medium of communication, enabling the formerly dissevered parishioners to obtain a certain, convenient, and safe intercourse with their pastor, and to and from their parish church, forms a boon of a magnitude seldom bestowed by individual generosity. In the present case we have great pleasure in stating that the excellent individual who superintends the spiritual concerns of this parish, has, with a liberality that places him in a high position among the benefactors of his fellow-men, been at the sole expense of this edifice, which it is hoped will long remain a monument of his benevolence.

The general utility of structures of this kind embraces a wide range, especially in the districts of the country lying more remote from the great roads, and where, consequently, more extensive bridges, for the accommodation of carriages, are neither so much in request, nor are there funds obtainable for their erection: a knowledge, therefore, of such as is now before us cannot be too widely disseminated. With

this in view, then, besides giving the details of the principal object of this communication, it may be useful to many that a short summary of the details of the bridge itself be also given, for the information of those who may be inclined to adopt that or similar means of communication between localities naturally separated by rivers, ravines, or arms of the sea.

The Banchory Devenick Bridge, as already noticed, is on the suspension principle, and was erected after a design by Mr Smith, architect, Aberdeen. In its design it is well adapted to the situation, the great mass of the river passing between the two suspension piers, while, in time of floods, the side waterways give free passage to the swollen river. The main arch is 183 feet span, the two side suspended arches are each 48 feet, and, besides these, there are the two openings of 20 feet each on the right bank. These last are simply straight beam arches, and are only required for the flow of the river in floods. The actual waterway of the entire bridge is 320 feet, but the distance between the extreme abutments is 355 feet, and the entire length of roadway on the bridge is 383 feet or thereby. The two main piers, over which the chains are suspended, are, at the low or summer water-level, 13 feet by 7 feet, diminishing upwards to 11 feet 3 inches by 4 feet 3 inches at the level of the roadway, the height to this point being 15 feet. The abutments, *k* and *l*, in Fig. 1, are large masses of masonry adapted to resist the pull upon the backstay suspending chains which are here secured at as low a point as possible in the mass of masonry. On the top of each of the main piers are erected two columns of cast iron, 12 feet in height and 2 feet diameter, with entablature, forming a saddle on which the chains rest, at a height of 13 feet 3 inches above the roadway, or 30 feet 3 inches above the surface of the water. The roadway is suspended from two main chains, one on each side, consisting of single rods of iron 2 inches diameter and 7 feet long each, connected by side links and bolts in the usual way. The vertical suspending rods, of $\frac{7}{8}$ inch diameter, are appended at the connecting links of the chain, and their lower extremities pass down through transverse beams of cast iron; these beams are $4\frac{1}{2}$ inches deep, flaunched at top and bottom, and have their ends terminating in a tenon, upon which a face-plate, 6 inches deep by $1\frac{3}{4}$ inches thick, is morticed, which thus forms a continuous *facia* to the arch. The beams, where they are perforated for the vertical suspending rods, are shouldered so as to form a series of king-posts of a horizontal truss, the space between each two beams being filled in with two diagonal wooden braces, by which the frame-work of the roadway is converted into one continuous truss. The platform of the roadway is formed of battens or planks 7 inches by $2\frac{1}{2}$ inches, bolted to the flaunches of the beams, and are laid with their edges $1\frac{1}{2}$ inch apart, to give free ventilation for the preservation of the timber, and also, as is supposed, by allowing the wind to pass through, tends in some degree to counteract the usual tendency to undulation of the roadway in gales of wind. The parapet or side railings of this bridge are $3\frac{1}{2}$ feet high, formed with substantial upright timbers and top-rail, and, as exhibited in the figure, are very judiciously formed into two more series of diagonal trussings, which, aided by the trussing of the roadway beams, greatly increases the capability of the bridge to resist resilience, with, as in such cases, its attendant undulation, and thus become conservative of its stability. It is remarkable that in early constructions of this kind, the trussed or lattice-form railing was seldom adopted, and it is only in later erections that this fundamental principle of construction has been duly attended to in such structures. This very useful edifice was completed for a sum bordering on £1400, and, considering the exchequer from which it was disbursed, this seems a large sum; but considering also the amount of usefulness and the extent of waterway afforded by the bridge, the expense seems sufficiently moderate. This last view is more especially impressed when the efficiency of the structure is considered; for, by a strict calculation, we find that the main suspension chains are capable of sustaining the strain that would be produced from nine times the weight of the entire arch, or three times that produced by filling the roadway of the suspended arch from end to end with men. The test with men is the severest trial that can be brought upon bridges of this kind, except, indeed, the case of such a body of men marching in a measured time; but this last test should never be allowed on suspended arches. It appears that, from the system of trussing horizontally and vertically, adopted in the construction of this bridge, the usual vibration and undulation, so troublesome in light structures of this kind, are both very much reduced, whether arising from winds or from the transit of passengers.

TRUSSED IRON SWING-TREE

FIG. 6

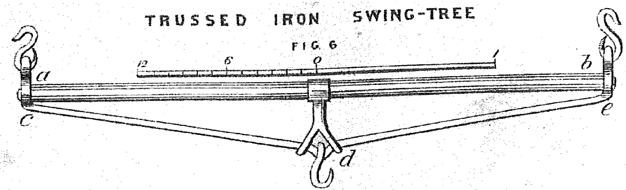


FIG. 4

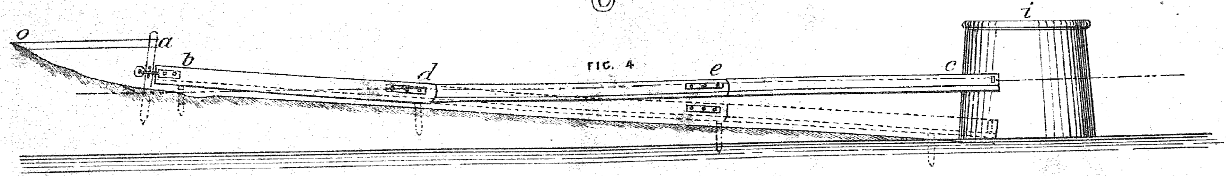
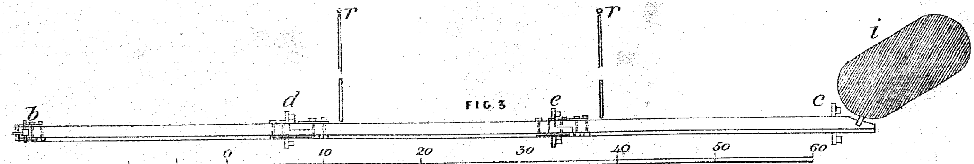
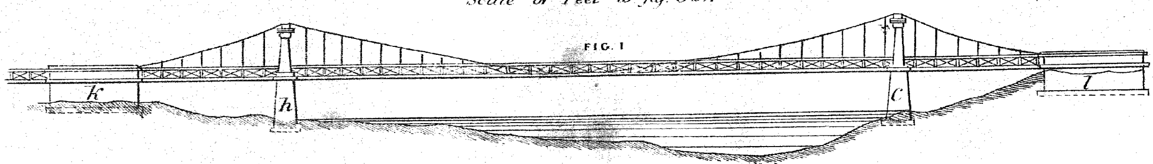


FIG. 3



Scale of Feet to figs 3 & 4

FIG. 1



ST DEVENICH SUSPENSION BRIDGE, ON THE RIVER DEE;

Shewing the Details of the Self-Acting Fender.

FIGS 1, 2, 3, 4, 5

FIG 2

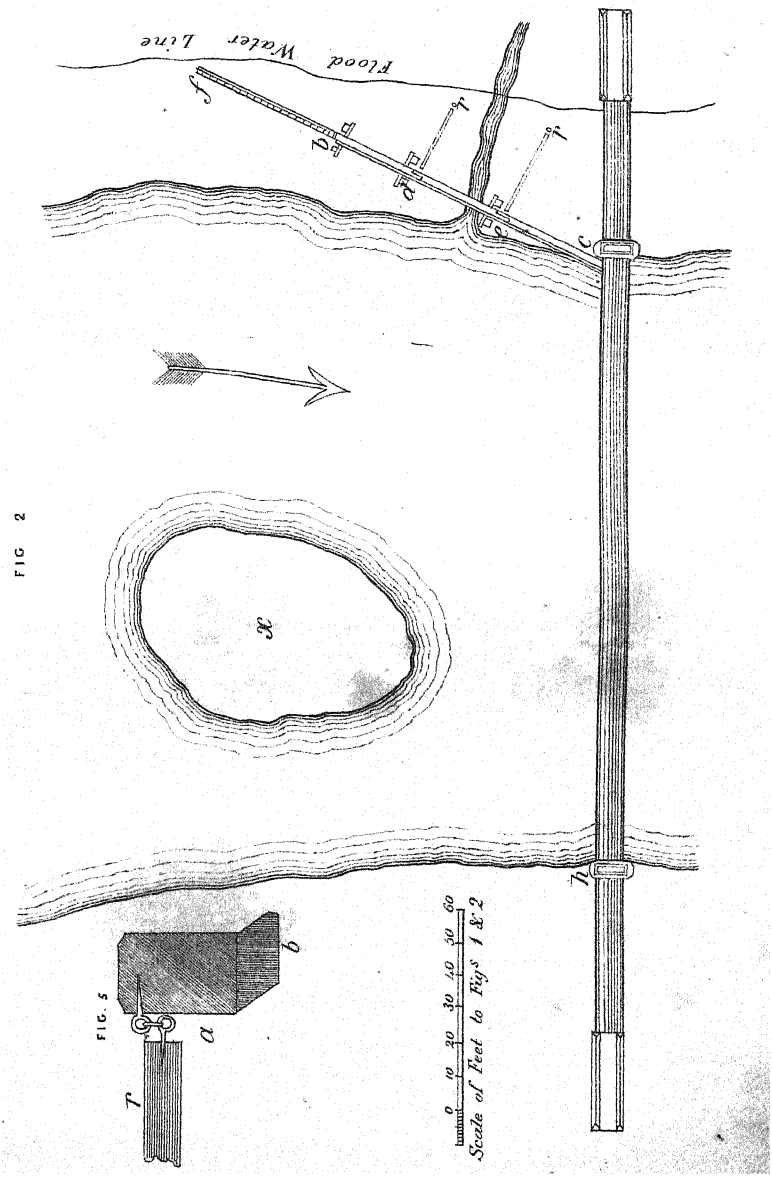

Flood Water Line
f
d
e
c
x
h
r
a
b
Scale of Feet to Figs 1 & 2
0 10 20 30 40 50 60

FIG. 5

IMPROVED IRON SWINGTREE.

By Mr James Slight, Engineer, Edinburgh, Curator of Models in the Museum of the Highland and Agricultural Society.

The simple implement, the swingtree or draught-bar, which from time immemorial has been constructed of wood, with or without iron mounting, has, with the extension in the application of iron to a numerous variety of purposes, in latter times, likewise felt the innovation, and the swingtree is now to be seen of iron, as well as the plough, the harrow, and many other implements. The advantages of iron for many of these purposes requires no illustration; its great durability compared with wood for all exposed purposes will continue to increase the number of cases to which it may be applicable. In its application to the swingtree we see a variety of forms, such as a hollow oval tube, a solid bar, differing only from that of wood in its breadth and thickness, and more lately in the form of an elongated open lozenge, the last being the nearest approach to a perfect construction that had then appeared. About five years ago, I was led into the consideration of the most proper form for a swingtree of iron, and it is not difficult to trace the arrangement that will produce the greatest strength with a given weight of material. This last element is not so much a matter of shillings and pence as for the advantages which it affords of reduction in weight; and to obtain the two leading elements, the greatest strength with the least weight, the common truss, with *strut* and two angular ties presents itself. But to give the necessary rigidity to a strut, it must either have a considerable quantity of matter in its mass, which, in the case of iron in a solid form, would, for the object here in view, become too heavy, or the strut must be so formed as to present a large surface with correspondingly small bulk of material. This may be obtained in two ways; it may be a tube, or it may be so formed that its transverse section shall be in the form of the sign +. For various reasons, the tube is the most suitable and convenient for our purpose. For the ties of a truss, such as is here required, the simple solid rod of malleable iron is at once the best and most commodious.

With the foregoing principles in view, the new swingtree was constructed, and a model of it placed in the Society's Museum in 1839. In 1843 a set of the swingtrees was exhibited at the General Show at Dundee, when the Silver Medal was awarded for the invention. In the accompanying plate, Fig. 6 represents this swingtree; *a b* is the strut, or that member of it that resists the strain

by compression, and is formed of a malleable iron tube with solid ends. The angular ties, *c d e*, or that member which resists by tension, is a solid rod of malleable iron of the finest quality; at *c* and *e* it is worked into an eye, to which the draught hooks are attached, and it is rivetted besides upon the solid ends of the tube *a b*. At the apex, *d*, the junction of the ties is thickened, and very slightly arched; the first to compensate for the wear that goes on at that point, and the second to retain the hook in its due position; but this last is further effected by the forked stay that is applied here for the purpose of binding the parts together.

In a swingtree of wood we can always guess at its power of resistance, from experience, and by simply inspecting the quality of the material, but not so with iron; for though we can predicate as to what a certain thickness of iron, under certain circumstances, *ought* to be capable of resisting, yet we have not the same facilities of judging with certainty by simple inspection. With this material, therefore, we have recourse to the actual *test*, loading the apparatus, whatever it may be, to any proposed limit, and by so doing we arrive at a perfect certainty as to the strength of the apparatus so tested, hence our dependence on such tested instruments is more secure than the vague guess made at the strength of untested wood. For these reasons I test every swingtree made upon this improved construction with a direct strain of five times that which it will be subjected to in ordinary working.

The absolute weight of these iron swingtrees is, on an average, the same as those made of ash wood when mounted with iron, or about 22℔ per set of three, and their price 15s. per set, being about the same proportion higher than wood that an iron plough is higher than a wooden one. This new swing-tree is now in the hands of a number of agriculturists, giving general satisfaction.

REPORT OF EXPERIMENTS WITH SPECIAL MANURES.

By Mr A. F. Gardner, Overseer to Mr Fleming of Barrochan, Renfrewshire.

[Premium—Thirty Sovereigns.]

In laying before the Highland and Agricultural Society the results of the experiments recorded in the following Tables, it has been my endeavour to make them as accurate as possible, having selected such parts of each field upon which they were made of as nearly a uniform quality as regards soil, exposure, drainage, &c., as far as circumstances would admit of. Each portion was accurately measured, and the different manures weighed and applied under my own inspection, as was also the produce from each portion, so that I think their correctness may be relied upon; and this is in a great measure confirmed by the average produce of other parts of the fields which were treated nearly in the same manner, with farm-yard dung and special manures, not having fallen short of that given in the tables. The different appearances which these crops presented during their growth was carefully noted down during the course of the season, and the remarks appended to these tables have been made from them.

The price may appear high at which I have estimated the Swedish turnips, viz., 20s. per ton, but this is their average price in this locality, and indeed they not unfrequently bring from 25s. to 30s. per ton. The price I have set down for the potatoes, viz., 35s. per ton, was the market price when I drew up the tables, but they often bring as much here as from 50s. to 70s. per ton. All the prices of the produce given in the tables were of the value of the different kinds in the market at the time, and the same remark applies to the manures. The experiments upon the turnip crop were all made upon the Swedish turnip, as this variety, requiring the best land and manure to grow a good crop, seemed most likely to give the fairest comparative results of the value of the substances tried as fertilizers.

I have only to add my hope that the remarks appended to the tables will be found sufficiently explicit to render any further explanation unnecessary—and they have been placed together after the tables, rather than in intervals between them, in order that the tables might not be too much sub-divided in the setting up.

TABLE A.—Exhibiting the Results of the Application of Special Manures Top-dressed upon Sown Grasses saved for Hay. Top-dressed 7th May; cut 5th July; weighed and stacked 14th August. All calculations made on the scale of One Imperial Acre. Hay valued at L.3 per Ton. Common Manure, Turnips and Potatoes, estimated by the Ton and its sub-divisions—Grain, per Quarter and sub-divisions—Hay and Straw, per Cwt. and sub-divisions—Special Manures, per Cwt. and sub-divisions.

No.	Substances Employed.	GENERAL PREVIOUS STATE OF THE SOIL. Nature of the Soil.	Previous Culture or Treatment.	APPLICATION OF SPECIAL MANURES, *Mentioned in Column 1st.* Quantity of Specific Manure.	Cost of ditto per Cwt.	Cost of ditto per Acre.	Total Cost.	EFFECTS OF SPECIAL MANURES. Produce of Hay per Acre.	Value of the Hay Crop.	ECONOMICAL RESULTS OF THE APPLICATION OF SPECIAL MANURES. Excess of Produce in Hay.	Value of Excess in Hay.	Gain from the Application.	Loss from the Application.
				cwt. lbs.	L. s. d.	L. s. d.	L. s. d.	cwt. lbs.	L. s. d.	cwt. lbs.	L. s. d.	L. s. d.	L. s. d.
1.	Nothing, average of four lots,	Sitff Clay Loam.	Oats after Green Crop	...	...	...	...	26 64	3 19 6	...	...	...	...
2.	Nitrate of Soda,	...	...	1 56	0 16 0	1 4 0	1 4 0	37 8	5 11 0	10 56	1 11 6	0 7 6	...
3.	Nitrate of Potash,	...	...	1 56	1 4 0	1 16 0	1 16 0	40 72	6 2 3	14 8	2 2 0	0 6 0	...
4.	Muriate of Ammonia,	...	...	1 56	0 16 0	1 4 0	1 4 0	35 88	5 7 3	9 24	1 7 8	0 3 8	...
5.	Sal Ammoniac,	...	...	1 56	3 0 0	4 10 0	4 10 0	40 104	6 19 9	14 40	2 3 3	...	2 6 9
6.	Sulphate of Ammonia	...	...	1 56	0 14 0	1 1 0	1 1 0	48 0	7 4 0	21 48	3 4 3	2 3 3	...
7.	Peruvian Guano,	...	...	2 0	0 10 0	1 0 0	1 0 0	52 56	7 17 6	25 104	3 17 3	2 17 3	...
8.	African Guano,	...	...	2 0	0 9 0	0 18 0	0 18 0	50 88	7 12 3	24 24	3 12 7	2 14 7	...
9.	Rape-dust,	...	...	5 0	0 6 0	1 10 0	1 10 0	29 96	4 9 3	3 32	0 9 9	...	1 0 3
10.	Nitrate of Soda,	...	...	2 0	0 16 0	1 12 0	1 12 0	54 48	8 3 0	27 96	4 3 3	2 11 3	...
11.	Muriate of Ammonia,	...	...	2 0	0 16 0	1 12 0	1 12 0	37 80	5 13 0	11 16	1 13 6	0 1 6	...
12.	Sulphate of Ammonia	...	...	2 0	0 14 0	1 8 0	1 8 0	44 64	6 13 6	18 0	2 14 0	1 6 0	...
13.	Rape-dust,	...	...	4 0	0 6 0	1 4 0	1 4 0	36 24	5 8 7	9 72	1 18 6	...	0 4 3
	Common Salt,	...	...	1 0	0 0 9	0 0 9	0 0 9						
	Nitrate of Soda,	...	...	0 56	0 16 0	0 8 0	0 8 0						
							1 12 9						
14.	African Guano,	...	...	1 0	0 9 0	0 9 0	0 9 0	30 24	4 10 6	3 72	0 11 0	...	0 4 9
	Common Salt,	...	...	1 0	0 0 9	0 0 9	0 0 9						
	Sulphate of Soda,	...	...	1 0	0 6 0	0 6 0	0 6 0						
							0 15 9						

15.	Peruvian Guano,	...	...	1 0	0 10 0	0 10 0	0 10 0	34	67	5 3 6	8 3	1 4 0	0 8 3	...
	Common Salt, .	...	...	1 0	0 0 9	0 0 9	0 0 9							
	Sulphate of Soda,	...	...	1 0	0 6 0	0 6 0	0 6 0							
							0 16 9							
16.	Sulphate of Ammonia	...	...	1 0	0 14 0	0 14 0	0 14 0	39	47	5 18 0	12 95	1 18 6	0 15 9	...
	Common Salt, .	...	...	1 0	0 0 9	0 0 9	0 0 9							
	Sulphate of Magnesia	...	...	1 0	0 8 0	0 8 0	0 8 0							
							1 2 9							
17.	Muriate of Ammonia,	...	...	1 0	0 16 0	0 16 0	0 16 0	42	109	6 8 9	16 45	0 2 9	1 4 3	...
	Common Salt, .	...	...	1 0	0 0 9	0 0 9	0 0 9							
	Sulphate of Magnesia	...	...	1 0	0 8 0	0 8 0	0 8 0							
							1 4 9							
18.	Peruvian Guano,	...	...	0 56	0 10 0	0 5 0	0 5 0	40	64	6 1 6	14 0	2 2 0	1 5 9	...
	Common Salt, .	...	...	1 0	0 0 9	0 0 9	0 0 9							
	Nitrate of Soda, .	...	...	0 28	0 16 0	0 4 0	0 4 0							
	Sulphate of Soda,	...	...	0 56	0 8 0	0 4 0	0 4 0							
	Carbon. of Magnesia,	...	...	0 28	0 10 0	0 2 6	0 2 6							
							0 16 3							
19.	African Guano, .	...	...	0 56	0 9 0	0 4 6	0 4 6	33	72	5 1 0	7 8	1 1 0	0 5 3	...
	Common Salt, .	...	...	1 0	0 0 9	0 0 9	0 0 9							
	Nitrate of Soda, .	...	...	0 28	0 16 0	0 4 0	0 4 0							
	Sulphate of Soda,	...	...	0 56	0 8 0	0 4 0	0 4 0							
	Carbon. of Magnesia,	...	...	0 28	0 10 0	0 2 6	0 2 6							
							0 15 9							
20.	Bone Liquor, or the Water in which Bones had been boiled, .	...	...	200 gallons, price not known.				47	99	7 3 5	21 35	3 3 9	*3 3 9	...

* Supposing the application cost nothing.

TABLE B.—Exhibiting the Results of the Application of Special Manures Top-dressed upon Eleven-Years-Old Lea saved for Hay. Top-dressed 23d April; cut 12th July; stacked and weighed 15th August. All calculations made on the scale of One Imperial Acre. Hay valued at L.3 per Ton. Common Manure, Turnips, and Potatoes, estimated by the Ton and its sub-divisions—Grain, per Quarter and sub-divisions—Hay and Straw, per Cwt. and sub-divisions—Special Manures, per Cwt. and sub-divisions.

		GENERAL PREVIOUS STATE OF THE SOIL.		APPLICATION OF SPECIAL MANURES *Mentioned in Column 1st.*				EFFECTS OF SPECIAL MANURES.		ECONOMICAL RESULTS OF THE APPLICATION OF SPECIAL MANURES.		
No.	Substances Employed.	Nature of the Soil.	Previous Culture or Treatment.	Quantity of Specific Manure.	Cost of ditto per Cwt.	Cost of ditto per Acre.	Total Cost.	Produce of Hay per Acre.	Value of the Hay Crop.	Excess of Produce in Hay.	Value of Excess in Hay.	Gain from the Application.
				cwt. lbs.	L. s. d.	L. s. d.	L. s. d.	cwt. lbs.	L. s. d.	cwt. lbs.	L. s. d.	L. s. d.
1.	In different parts of field, Nothing, average of 3 lots,	Stiff Loam.	Eleven-Years Old Lea cut for Hay 1843, & again this Season 1844.	~	~	~	~	28 58	4 5 6			
2.	African Guano, ...	~		2 0	0 9 0	0 18 0	0 18 0	40 80	6 2 0	12 22	1 16 6	0 9 0
	Common Salt, ...	~		2 0	0 0 9	0 1 6	0 1 6					
	Animal Charcoal, . . .	~		2 0	0 4 0	0 8 0	0 8 0					
							1 7 6					
3.	Peruvian Guano, ...	~	~	2 0	0 10 0	1 0 0	1 0 0	42 48	6 7 0	13 102	2 1 9	0 12 3
	Common Salt, ...	~	~	2 0	0 0 9	0 1 6	0 1 6					
	Animal Charcoal, . . .	~	~	2 0	0 4 0	0 8 0	0 8 0					
							1 9 6					
4.	Peruvian Guano, ...	~	~	2 0	0 10 0	1 0 0	1 0 0	45 96	6 17 4	17 38	2 11 6	1 11 6
5.	African Guano, ...	~	~	2 0	0 9 0	0 18 0	0 18 0	39 96	5 19 3	11 38	1 13 9	0 15 9
6.	Nitrate of Soda, ...	~	~	1 56	0 16 0	1 4 0	1 4 0	39 76	5 19 0	11 18	1 13 6	No gain.
	Common Salt, ...	~	~	2 0	0 0 9	0 1 6	0 1 6					
	Animal Charcoal, . . .	~	~	2 0	0 4 0	0 8 0	0 8 0					
							1 13 6					

7.	Muriate of Ammonia, . . .	~	~	1 56	0 16 0	1 4 0	1 4 0	45 72	6 17 0	17 14	0 2 11	0 18 0
	Common Salt, ...	~	~	2 0	0 0 9	0 1 6	0 1 6					
	Animal Charcoal, . . .	~	~	2 0	0 4 0	0 8 0	0 8 0					
							1 13 6					
8.	Nitrate of Potash, . . .	~	~	1 56	1 4 0	1 12 0	1 12 0	44 64	6 13 6	16 6	2 8 0	0 6 6
	Common Salt, ...	~	~	2 0	0 0 9	0 1 6	0 1 6					
	Animal Charcoal, . . .	~	~	2 0	0 4 0	0 8 0	0 8 0					
							2 1 6					
9.	Peruvian Guano, . . .	~	~	1 56	0 10 0	0 15 0	0 15 0	45 0	6 15 0	16 54	2 9 6	1 7 1½
	Animal Charcoal, . . .	~	~	1 0	0 4 0	0 4 0	0 4 0					
	Common Salt, ...	~	~	0 56	0 0 9	0 0 4½	0 0 4½					
	Sulphate of Soda, . . .	~	~	0 56	0 6 0	0 3 0	0 3 0					
							1 2 4½					
10.	African Guano, ...	~	~	1 56	0 9 0	0 13 6	0 13 6	43 62	6 10 6	15 4	2 5 0	1 4 1½
	Animal Charcoal, . . .	~	~	1 0	0 4 0	0 4 0	0 4 0					
	Common Salt, ...	~	~	0 56	0 0 9	0 0 4½	0 0 4½					
	Sulphate of Soda, ...	~	~	0 56	0 6 0	0 3 0	0 3 0					
							1 0 10½					
11.	Peruvian Guano, ...	~	~	1 0	0 10 0	0 10 0	0 10 0	39 48	5 18 0	10 102	1 12 9½	0 13 8
	Animal Charcoal, . . .	~	~	1 0	0 4 0	0 4 0	0 4 0					
	Common Salt, ...	~	~	0 56	0 0 9	0 0 4½	0 0 4½					
	Sulphate of Magnesia, . .	~	~	0 56	0 8 0	0 4 0	0 4 0					
	Gypsum, ...	~	~	0 56	0 1 6	0 0 9	0 0 9					
							0 19 1½					
12.	Peruvian Guano, . . .	~	~	1 56	0 10 0	0 15 0	0 15 0	62 16	9 6 0	33 70	5 [illegible] 0 10½	3 12 0
	Animal Charcoal, . . .	~	~	1 0	0 4 0	0 4 0	0 4 0					
	Muriate of Ammonia, . .	~	~	0 56	0 16 0	0 8 0	0 8 0					
	Common Salt, ...	~	~	0 56	0 0 9	0 0 4½	0 0 4½					
	Gypsum, ...	~	~	1 0	0 1 6	0 1 6	0 1 6					
							1 8 10½					

Table B.—(*Continued.*)

No.	Substances Employed.	GENERAL PREVIOUS STATE OF THE SOIL. Nature of the Soil.	GENERAL PREVIOUS STATE OF THE SOIL. Previous Culture or Treatment.	APPLICATION OF SPECIAL MANURES *Mentioned in Column 1st.* Quantity of Specific Manure. cwt. lbs.	Cost of ditto per Cwt. L. s. d.	Cost of ditto per Acre. L. s. d.	Total Cost. L. s. d.	EFFECTS OF SPECIAL MANURES. Produce of Hay per Acre. cwt. lbs.	Value of the Hay Crop. L. s. d.	ECONOMICAL RESULTS OF THE APPLICATION OF SPECIAL MANURES. Excess of Produce in Hay. cwt. lbs.	Value of Excess in Hay. L. s. d.	Gain from the Application. L. s. d.
	Peruvian Guano,	Stiff Loam.	Eleven-Years OldLea cut for Hay 1843, & again this Season 1844.	1 0	0 10 0	9 10 0	0 10 0					
	Animal Charcoal,			1 0	0 4 0	0 4 0	0 4 0					
	Common Salt,	〃		0 56	0 0 9	0 0 4½	0 0 4½					
13.	Sulphate of Magnesia,	〃		0 56	0 8 0	0 4 0	0 4 0	54 0	8 2 0	25 54	3 16 6	2 6 1½
	Nitrate of Soda,	〃		0 56	0 16 0	0 8 0	0 8 0					
	Carbonate of Magnesia,	〃	〃	0 28	0 10 0	0 2 6	0 2 6					
	Sulphate of Soda,	〃	〃	0 28	0 6 0	0 1 6	0 1 6					
							1 10 4½					
	African Guano,	〃	〃	1 0	0 9 0	0 9 0	0 9 0					
	Animal Charcoal,	〃	〃	1 0	0 4 0	0 4 0	0 4 0					
	Common Salt,	〃	〃	0 56	0 0 9	0 0 4½	0 0 4½					
14.	Sulphate of Magnesia,	〃	〃	0 56	0 8 0	0 4 0	0 4 0	44 64	6 13 6	16 6	2 8 0	0 18 7
	Nitrate of Soda,	〃	〃	0 56	0 16 0	0 8 0	0 8 0					
	Carbonate of Magnesia,	〃	〃	0 28	0 10 0	0 2 6	0 2 6					
	Sulphate of Soda,	〃	〃	0 28	0 6 0	0 1 6	0 1 6					
							1 9 4½					
	Bone-dust dissolved in Sulphuric Acid,	〃	〃	1 0	0 5 0	0 5 0	0 5 0					
		〃	〃	0 56	0 14 0	0 7 0	0 7 0					
	Wood Charcoal,	〃	〃	1 0	0 1 6	0 1 6	0 1 6					
15.	Common Salt,	〃	〃	0 56	0 0 9	0 0 4½	0 0 4½	43 56	6 10 6	14 110	2 5 0	1 1 1½
	Sulphate of Magnesia,	〃	〃	0 28	0 8 0	0 2 0	0 2 0					
	Kelp,	〃	〃	1 0	0 3 0	0 3 0	0 3 0					
	Peruvian Guano,	〃	〃	0 56	0 10 0	0 5 0	0 5 0					
							1 3 10½					

16.	Ammoniacal Liquor,	--	--	100 Gals.	0 0 0	0 10 0	0 10 0						
	Fine Moss Earth,	--	--	5 0	0 0 0	0 1 0	0 1 0						
	Common Salt,	--	--	0 56	0 0 9	0 0 4½	0 0 4½	41	58	6 4 6	13 0	1 19 0	0 15 7½
	Animal Charcoal,	--	--	1 0	0 4 0	0 4 0	0 4 0						
	Sulphate of Soda,	--	--	0 56	0 6 0	0 3 0	0 3 0						
	Carbonate of Magnesia,	--	--	0 56	0 10 0	0 5 0	0 5 0						
							1 3 4½						
17.	Animal Charcoal.	--	--	2 0	0 4 0	0 8 0	0 8 0						
	Sulphuric Acid,	--	--	1 0	0 14 0	0 14 0	0 14 0						
	Carbonate of Magnesia,	--	--	0 28	0 10 0	0 2 6	0 2 6	57	96	8 13 3	29 38	4 7 9	2 13 3
	Sulphate of Magnesia,	--	--	0 28	0 8 0	0 2 0	0 2 0						
	Muriate of Ammonia,	--	--	0 28	0 16 0	0 4 0	0 4 0						
	Carbonate of Soda,	--	--	0 56	0 16 0	0 8 0	0 8 0						
							1 18 6						

Table C.—Exhibiting the Results of the Application of Special Manures to the Potato Crop when Planted. Planted 29th April, lifted and weighed 7th October 1844. All calculations made on the scale of One Imperial Acre. Potatoes valued at 35s. per Ton—Common Manure, Turnips, and Potatoes, estimated by the Ton and its sub-divisions—Grain, per Quarter and sub-divisions—Hay and Straw, per Cwt. and sub-divisions—Special Manures, per Cwt. and sub-divisions.

		GENERAL PREVIOUS STATE OF THE SOIL.				APPLICATION OF SPECIAL MANURES *Mentioned in Column 1st.*				EFFECTS OF SPECIAL MANURES.		ECONOMICAL RESULTS OF THE APPLICATION OF SPECIAL MANURES.			
No	Substances Employed.	Nature of the Soil.	Previous Culture or Treatment.	Quantity of Farm-Yard Manure.	Value of ditto per Ton.	Quantity of Specific Manure.	Cost of ditto per Cwt.	Cost of ditto per Acre.	Cost per Acre of both Common and Special Manure.	Produce in Bulbs.	Value of Bulbs.	Excess of Produce of Bulbs.	Value.	Gain from the Application	REMARKS.
				tons. cwt.	L. s. d.	cwt. lbs.	L. s. d.	L. s. d.	L. s. d.	tons. cwt. lbs.	L. s. d.	tons. cwt. lbs.	L. s. d.	L. s. d.	
1.	Farm-Yard Dung,	Stiff Loam.	Oats from	25 0	0 7 0	..	..	..	8 15 0	14 1 0	24 2 9	..	..	..	Special Manures were applied at the time the Farm-Yard Manure was put into the drills.
2.	Farm-Yard Dung.	See	Lea	15 0	0 7 0	..	..	5 5 0	5 5 0	17 0 0	29 15 0	2 19 0	5 3 3	7 8 4½	
2.	Peruvian Guano, .	Analysis,	Trenched	..	..	2 0	0 10 0	1 0 0	1 0 0						
2.	Sulphate of Magnesia,	Appendix.	with Spade	..	..	0 28	0 8 0	0 2 0	0 2 0						
2.	Carbon. of Magnesia,	..	1843.	..	..	0 14	0 10 0	0 1 3	0 1 3						
2.	Common Salt, . .	..	..	..	..	0 84	0 0 9	0 0 7¼	0 0 7¼						
									6 8 10¼						
3.	Farm-Yard Dung,	..	..	15 0	0 7 0	..	..	5 5 0	5 5 0	15 2 0	26 8 6	1 1 0	1 16 9	4 3 10	
3.	African Guano,	..	..	..	..	2 0	0 9 0	0 18 0	0 18 0						
3.	Sulph. of Magnesia,	..	..	..	..	0 28	0 8 0	0 2 0	0 2 0						
3.	Carbon. of Magnesia,	..	..	..	..	0 14	0 10 0	0 1 3	0 1 3						
3.	Common Salt, . .	..	..	..	..	0 84	0 0 9	0 0 7¼	0 0 7¼						
									6 6 10¼						
4.	Farm-Yard Dung,	..	..	31 0	0 7 0	..	..	..	10 17 0	17 4 0	30 2 0	3 3 0	5 10 3	3 8 3	
5.	Farm-Yard Dung,	..	..	12 0	0 7 0	..	..	4 4 0	4 4 0	18 3 23	31 15 3	4 2 23	7 3 6	9 12 6	
5.	Peruvian Guano,	..	..	..	..	3 0	0 10 0	1 10 0	1 10 0						
5.	Gypsum, . . .	..	..	..	..	1 0	0 1 6	0 1 6	0 1 6						
5.	Animal Charcoal,	..	..	..	..	2 0	0 4 0	0 8 0	0 8 0						
5.	Carbon. of Magnesia,	..	..	..	..	0 28	0 10 0	0 2 6	0 2 6						
									6 6 0						

6.	Farm-Yard Dung,	..	..	12 0	0 7 0	..	..	..	..						
	African Guano, .	..	..	..	..	3 0	0 9 0	1 7 0	1 7 0						
	Gypsum, . . .	.	..	..	..	1 0	0 1 6	0 1 6	0 1 6	19 1 13	33 6 9	5 0 13	8 15 0	11 7 0	
	Animal Charcoal,	.	.	..	..	2 0	0 4 0	0 8 0	0 8 0						
	Carbon. of Magnesia,	.	..	..	..	0 28	0 10 0	0 2 6	0 2 6						
									6 3 0						
7.	Farm-Yard Dung,	..	..	35 0	0 7 0	..	..	..	12 5 0	19 2 0	33 8 6	5 1 0	8 16 9	5 6 9	
8.	Farm-Yard Dung,	..	..	15 0	0 7 0	..	..	5 5 0	5 5 0						
	Animal Charcoal,	..	..	..	..	1 0	0 4 0	0 4 0	0 4 0						
	Sulphuric Acid, .	..	..	..	..	0 56	0 14 0	0 7 0	0 7 0						
	Carbon. of Magnesia,	..	..	..	..	0 14	0 10 0	0 1 3	0 1 3	20 3 19	35 5 3	6 2 19	10 13 6	13 5 0	
	Common Salt, .	..	..	..	..	1 0	0 0 9	0 0 9	0 0 9						
	Gypsum, . . .	..	..	..	..	1 0	0 1 6	0 1 6	0 1 6						
	Nitrate of Soda, .	..	..	..	..	0 28	0 16 0	0 4 0	0 4 0						
									6 3 6						
9.	Farm-Yard Dung,	..	..	12 0	0 7 0	..	..	4 4 0	4 4 0						
	Sugar Scum, . .	..	..	..	..	40 0	0 0 6	1 0 0	1 0 0						
	Animal Charcoal,	..	..	..	..	2 0	0 4 0	0 8 0	0 8 0						
	Gypsum, . . .	..	..	..	..	1 0	0 1 6	0 1 6	0 1 6	15 2 17	26 8 6	1 1 0	1 16 9	3 2 6	
	Carbon. of Magnesia,	..	..	..	..	0 56	0 10 0	0 5 0	0 5 0						
	Potash, ...	..	..	..	..	1 0	1 10 0	1 10 0	1 10 0						
	Common Salt, . .	..	..	..	..	1 0	0 0 9	0 0 9	0 0 9						
									7 9 3						
10.	Peruvian Guano,	..	..	..	..	6 0	0 10 0	3 0 0	3 0 0	12 0 6	21 0 0				
11.	African Guano, .	..	..	..	..	6 0	0 9 0	2 14 0	2 14 0	10 4 0	17 7 0				
12.	Farm-Yard Dung,	..	..	30 0	0 7 0	..	..	10 10 0	10 10 0	16 2 0	28 3 6	2 1 0	3 11 9	1 16 9	

Table C.—(*Continued.*)

No.	Substances Employed.	GENERAL PREVIOUS STATE OF THE SOIL. Nature of the Soil.	Previous Culture or Treatment.	Quantity of Farm-Yard Manure.	Value of ditto per Ton.	APPLICATION OF SPECIAL MANURES *Mentioned in Column 1st.* Quantity of Specific Manure.	Cost of ditto per Cwt.	Cost of ditto per Acre.	Cost per Acre of both Common and Special Manure.	EFFECTS OF SPECIAL MANURES. Produce in Bulbs.	Value of Bulbs.	ECONOMICAL RESULTS OF THE APPLICATION OF SPECIAL MANURES. Excess of Produce of Bulbs.	Value.	Gain from the Application	REMARKS.
				tons. cwt.	L. s. d.	cwt. lbs.	L. s. d.	L. s. d.	L. s. d.	tons. cwt. lbs.	L. s. d.	tons. cwt. lbs.	L. s. d.	L. s. d.	
13.	Farm-Yard Dung,	Stiff Loam. See Analysis, Appendix.	Oats from Lea Trenched with Spade 1843.	12 0	0 7 0	..	..	4 4 0	4 4 0	14 4 17	24 17 0	0 3 17	0 5 3	2 12 0	Special Manures were applied at the time the Farm-Yard Manure was put into the drills.
	and Moss Earth saturated with			..	..	40 0	0 2 0	0 7 0	0 7 0						
	100 gallons Liquor, in which bones were boiled,			..	..	100 gallons	0 5* 0								
	Carbon. of Magnesia,	..	..	..	..	0 56	0 10 0	0 5 0	0 5 0						
	Gypsum, . . .	..	..	..	..	1 0	0 1 6	0 1 6	0 1 6						
	Common Salt, .	..	..	..	..	1 0	0 0 9	0 0 9	0 0 9						
	Potash, ...	..	..	..	..	1 0	1 10 0	1 10 0	1 10 0						
									6 8 3						
14.	Farm-Yard Dung,	..	..	10 0	0 7 0	..	..	3 10 0	3 10 0	14 2 14	24 13 6	0 1 14	0 1 9	3 9 3	
	African Guano, .	..	..	..	..	4 0	0 9 0	1 16 0	1 16 0						
	Gypsum, . . .	..	..	..	..	1 0	0 1 6	0 1 6	0 1 6						
									5 7 6						
15.	Farm-Yard Dung,	..	..	10 0	0 7 0	..	..	3 10 0	3 10 0	14 4 0	24 17 0	0 3 0	0 5 3	3 8 9	
	Peruvian Guano,	..	..	..	..	4 0	0 10 0	2 0 0	2 0 0						
	Gypsum, . . .	..	..	..	..	1 0	0 1 6	0 1 6	0 1 6						
									5 11 6						

* Supposed cost.

Table D.—Exhibiting the Results of the Application of Special Manures upon Potatoes; Top-dressed on 7th June; lifted and weighed the 8th October. All calculations made on the scale of One Imperial Acre. Potatoes valued at 35s. per Ton.—Common Manure, Turnips, and Potatoes, estimated by the Ton and its sub-divisions—Grain, per Quarter and sub-divisions—Hay and Straw, per Cwt. and sub-divisions—Special Manures, per Cwt. and sub-divisions.

Rough Red Potatoes.

		General Previous State of the Soil.				Application of Special Manures *Mentioned in Column 1st.*				Effects of Special Manures.		Economical Results of the Application of Special Manures.			
No.	Substances Employed.	Nature of the Soil.	Previous Culture or Treatment.	Quantity o Farm Yard Manure.	Value of ditto per Ton.	Quantity of Specific Manure.	Cost of ditto per Cwt.	Cost of ditto per Acre.	Cost per Acre of both Common and Special Manure.	Produce in Bulbs.	Value of Bulbs.	Excess of Produce of Bulbs.	Value.	Gain from the Application	Remarks.
				tons. cwt.	L. s. d.	cwt. lbs.	s. d.	L. s. d.	L. s. d.	tons. cwt. lbs.	L. s. d.	tons. cwt. lbs.	L. s. d.	L. s. d.	
1.	Farm-Yard Dung,	Stiff Loam. Analysis in App.	Oats from Lea, Tren. with Spade, 1843.	25 0	0 7 0	...	...	8 15 0	8 15 0	12 5 37	21 9 2				Special Manures Top-dressed upon the Top of the Drills, after the Plants were through the Ground.
2.	Farm-Yard Dung, dressed with Nitrate of Soda and Sulphate of Magnesia, ...	...	...	25 0	0 7 0	...	...	8 15 0	8 15 0	15 15 21	27 11 3	3 9 96	6 2 0	4 9 0	
				...	...	1 56	16 0	1 4 0	1 4 0						
				...	...	1 56	6 0	0 9 0	0 9 0						
									10 8 0						
3.	Farm-Yard Dung, dressed with Sulphate of Ammonia and Sulphate of Magnesia, . .	...	...	25 0	0 7 0	...	...	8 15 0	8 15 0	17 2 55	29 19 4½	4 17 18	8 9 9	6 13 9	
				...	...	1 56	18 0	1 7 0	1 7 0						
				...	...	1 56	6 0	0 9 0	0 9 0						
									10 11 0						
4.	Farm-Yard Dung, dressed with Soot, in Bushels, Sulphate of Magnesia,	...	...	25 0	0 7 0	B.	...	8 15 0	8 15 0	13 11 92	23 15 6	1 6 55	2 6 4	1 7 4	
				...	...	40 0	0 3	0 10 0	0 10 0						
				...	...	1 56	6 0	0 9 0	0 9 0						
									9 14 0						

Table D.—*(Continued.)*

No.	Substances Employed.	GENERAL PREVIOUS STATE OF THE SOIL. Nature of the Soil.	Previous Culture or Treatment.	Quantity of Farm-Yard Manure.	Value of ditto per Ton.	APPLICATION OF SPECIAL MANURES *Mentioned in Column 1st.* Quantity of Specific Manure.	Cost of ditto per cwt.	Cost of ditto per Acre.	Cost per Acre of both Common and Special Manure.	EFFECTS OF SPECIAL MANURES. Produce in Bulbs.	Value of Bulbs.	ECONOMICAL RESULTS OF THE APPLICATION OF SPECIAL MANURES. Excess of Produce of Bulbs.	Value.	Gain from the Application	REMARKS.
				tons. cwt.	L. s. d.	cwt. lbs.	s. d.	L. s. d.	L. s. d.	tons. cwt. lbs.	L. s. d.	tons. cwt. lbs.	L. s. d.	L. s. d.	
5.	Farm-Yard Dung, dressed with Peruvian Guano and Gypsum, . .	Stiff Loam. Anal. App.	Oats from Lea, Tren. with Spade, 1843.	25 0 – –	0 7 0 – –	– 2 0 1 56	– 10 0 2 6	8 15 (1 0 0 0 3 9	8 15 0 1 0 0 0 3 9 10 12 9	15 3 17	26 9 5	2 18 92	5 2 9	3 19 0	Special Manures Top-dressed upon the Tops of the Drills, after the plants were through the groun .
6.	Farm-Yard Dung, dressed with African Guano and Gypsum,	–	–	25 0 – –	0 7 0 – –	– 2 0 1 56	– 9 0 2 6	8 15 0 0 18 0 0 3 9	8 15 0 0 18 0 0 3 9 9 14 9	14 7 75	25 5 3	2 2 38	3 14 0	2 12 3	
7.	Farm-Yard Dung, dressed with Animal Charcoal dissolved in Sulphuric Acid and Carbonate of Magnesia, ...	–	–	25 0 – –	0 7 0 – –	– 1 0 0 56 0 56	– 4 0 14 0 10 0	8 15 0 0 4 0 0 7 0 0 5 0	8 15 0 0 4 0 0 7 0 0 5 0 9 11 0	13 15 105	24 2 11	1 10 68	2 13 4	1 17 4	

Table E.—Exibiting the Results of the Application of Special Manures Top-dressed upon Oats, 9th May; cut 12th September; thrashed and weighed 8th October. All calculations made on the scale of One Imperial Acre. Oats valued at 2s. 6d. per Bushel, and Straw at 2s. per Cwt. Common Manure, Turnips, and Potatoes, estimated by the Ton and its sub-divisions—Grain, per Quarter and sub-divisions—Hay and Straw, per Cwt. and sub-divisions—Special Manures, per Cwt. and sub-divisions.

		General Previous State of the Soil.		Application of Special Manures *Mentioned in Column 1st.*				Effects of Special Manures.					Economical Results of the Application of Special Manures.							
No.	Substances Employed.	Nature of the Soil.	Previous Culture or Treatment.	Quantity of Specific Manure	Cost of ditto per Cwt.	Cost of ditto per Acre.	Cost per Acre of both Common and Special Manures	Produce of Grain per Acre.	Produce of Straw per Acre.	Weight of Grain per Bushel.	Value of the Grain Crop.	Value of the Straw Crop.	Excess of Produce in Grain.	Excess of Produce in Straw.	Value of Excess in Grain.	Value of Excess in Straw.	Value of Excess of Grain and Straw.	Gain from the Application.	Loss from the Application.	Remarks.
				cwt. lb.	L. s. d.	L. s. d.	L. s. d.	qr. b. p.	cwt. lb.	lb. oz.	L. s. d.	L. s. d.	qr. b. p.	cwt. lb.	L. s. d.	L. s. d.	L. s. d.	L. s. d.	L. s. d.	
1.	No Dressing, average of Four Portions,	Medium Loam Subsoil,	Trenched with the Spade out	..	..	..	..	6 3 0	30 21	40 8	6 7 6	3 0 4	..	..	..	..	..	..	..	*Special Manures* top-dressed upon the crop during heavy rain.
2.	Nitrate of Soda,	stiff yel-	of 9 Years'	2 0	0 16 0	1 12 0	1 12 0	7 0 2	45 39	39 0	7 1 3	4 10 6	0 5 2	15 19	0 13 9	1 10 3	2 4 0	0 12 0	..	
3.	Mur. of Ammonia,	low till,	Old Lea.	2 0	0 16 0	1 12 0	1 12 0	7 2 0	39 97	39 0	7 5 0	3 19 6	0 7 0	9 76	0 17 6	0 19 0	1 16 6	0 4 6	..	
4.	Sulph. of Ammon.	full of	..	2 0	0 18 0	1 16 0	1 16 0	7 4 1	47 60	38 8	7 10 7½	4 15 0	1 1 1	17 39	1 12 10½	1 14 6	2 17 4½	1 1 4½	..	
5.	Peruvian Guano,	stones.	..	2 0	0 10 0	1 0 0	1 0 0	7 6 3	35 73	40 8	7 16 10½	3 11 0	1 3 3	5 52	1 9 4½	0 11 0	2 0 4½	1 0 4½	..	
6.	African Guano,	..	..	2 0	0 9 0	0 18 0	0 18 0	6 7 2	37 0	40 0	6 18 9	3 14 0	0 4 2	6 91	0 11 3	0 13 6	1 5 0	0 7 0	..	
7.	Rape-Dust, . .	..	..	5 0	0 6 0	1 10 0	1 10 0	6 3 1	39 40	39 4	6 8 1½	3 18 6	0 0 1	9 19	0 0 7½	0 18 0	0 18 7½	..	0 11 4½	
8.	Common Salt, .	..	..	3 0	0 0 9	0 2 3	0 2 3	6 5 0	30 91	44 0	6 12 6	3 1 6	0 2 0	0 70	0 5 0	0 1 6	0 6 6	0 4 3	..	
9.	Sulph. of Magnesia	..	..	2 0	0 8 0	0 16 0	0 16 0	5 7 2	28 32	41 8	5 18 9	2 16 6	..	..	..	..	..	..	1 8 7	
10.	Sulphate of Soda,	..	..	2 0	0 6 0	0 12 0	0 12 0	5 5 3	29 67	42 4	5 14 4½	2 19 0	..	..	..	..	..	..	1 6 5½	
11.	Carbonate of Soda,	..	..	2 0	0 16 0	1 12 0	1 12 0	6 5 1	30 78	43 0	6 13 1½	3 1 0	0 2 1	0 59	0 5 7½	0 1 0	0 6 7½	..	1 5 4½	
12.	Animal Charcoal,	..	..	1 0	0 4 0	0 4 0	0 4 0	7 2 2	33 25	42 0	7 6 3	3 6 6	0 7 2	3 40	0 18 9	0 6 0	1 4 9	0 3 7½	..	
	Common Salt, .	..	..	1 56	0 0 9	0 1 1½	0 1 1½													
	Mur. of Ammonia,	..	..	1 0	0 16 0	0 16 0	0 16 0													
							1 1 1½													
13.	Rape-Dust, . .	..	..	4 0	0 6 0	1 4 0	1 4 0	6 5 1	33 52	42 0	6 13 1½	3 17 0	0 2 1	8 31	0 5 7½	0 16 6	1 2 1½	..	0 11 4½	
	Common Salt, .	..	..	2 0	0 0 9	0 1 6	0 1 6													
	Animal Charcoal,	..	..	1 0	0 4 0	0 4 0	0 4 0													
	Sulph. of Magnesia	..	..	0 56	0 8 0	0 4 0	0 4 0													
							1 13 6													
14.	African Guano,	..	..	1 0	0 9 0	0 9 0	0 9 0	7 2 0	36 99	42 8	7 5 0	3 16 6	0 7 0	6 18	0 17 6	0 13 0	1 10 6	0 12 0	..	
	Common Salt, .	..	..	2 0	0 0 9	0 1 6	0 1 6													
	Animal Charcoal,	..	..	1 0	0 4 0	0 4 0	0 4 0													
	Sulph. of Magnesia	..	..	0 56	0 8 0	0 4 0	0 4 0													
							0 18 6													
15.	Peruvian Guano,	..	..	1 0	0 10 0	0 10 0	0 10 0	8 6 3	40 27	41 12	8 16 10½	4 0 6	2 3 3	10 62	2 9 4½	1 0 0	3 9 4½	2 9 10½	..	
	Common Salt, .	..	..	2 0	0 0 9	0 1 6	0 1 6													
	Animal Charcoal,	..	..	1 0	0 4 0	0 4 0	0 4 0													
	Sulph. of Magnesia	..	..	0 56	0 8 0	0 4 0	0 4 0													
							0 19 6													

Table E.—(*Continued.*)

No.	Substances Employed	GENERAL PREVIOUS STATE OF THE SOIL. Nature of the Soil.	Previous Culture or Treatment.	APPLICATION OF SPECIAL MANURES *Mentioned in Column 1st.* Quantity of Specific Manure.	Cost of ditto per Cwt.	Cost of ditto per Acre.	Cost per Acre of both Common and Special Manures.	EFFECTS OF SPECIAL MANURES. Produce of Grain per Acre.	Produce of Straw per Acre.	Weight of Grain per Bushel.	Value of the Grain Crop.	Value of the Straw Crop.	ECONOMICAL RESULTS OF THE APPLICATION OF SPECIAL MANURES. Excess of Produce in Grain.	Excess of Produce in Straw.	Value of Excess in Grain.	Value of Excess in Straw.	Value of Excess of Grain and Straw.	Gain from the Application.	Loss from the Application.	REMARKS.
				cwt. lb.	L. s. d.	L. s. d.	L. s. d.	qr. b. p.	cwt. lb.	lb. oz.	L. s. d.	L. s. d.	qr. b. p.	cwt. lb.	L. s. d.	L. s. d.	L. s. d.	L. s. d.	L. s. d.	
16.	Sulph. of Ammon.	Medium Loam Subsoil, stiff yellow till, full of stones.	Trenched with the Spade out of 9-Years Old Lea.	1 0	0 18 0	0 18 0	0 18 0	8 3 0	43 76	40 8	8 7 6	4 7 0	2 0 0	13 55	2 0 0	1 7 0	3 7 0	1 19 6	..	Special Manures top-dressed upon the crop during heavy rain.
	Common Salt, .			2 0	0 0 9	0 1 6	0 1 6													
	Animal Charcoal,			1 0	0 4 0	0 4 0	0 4 0													
	Sulph. of Magnesia			0 56	0 8 0	0 4 0	0 4 0													
							1 7 6													
17.	Mur. of Ammonia,	..	..	1 0	0 16 0	0 16 0	0 16 0	7 7 0	45 93	39 12	7 17 6	4 11 6	1 4 0	15 72	1 10 0	1 11 0	3 1 0	1 15 6	..	
	Common Salt, .	..	..	2 0	0 0 9	0 1 6	0 1 6													
	Animal Charcoal,	..	..	1 0	0 4 0	0 4 0	0 4 0													
	Sulph. of Magnesia	..	..	0 56	0 8 0	0 4 0	0 4 0													
							1 5 6													
18.	Nitrate of Soda,	..	..	1 0	0 16 0	0 16 0	0 16 0	8 1 2	45	39 12	8 3 9	4 10 6	1 6 2	15 14	1 16 3	1 10 6	3 6 6	2 1 0	..	
	Common Salt, .	..	..	2 0	0 0 9	0 1 6	0 1 6													
	Animal Charcoal,	..	..	1 0	0 4 0	0 4 0	0 4 0													
	Sulph. of Magnesia	..	..	0 56	0 8 0	0 4 0	0 4 0													
							1 5 6													
19.	Carbonate of Soda,	..	..	1 0	0 16 0	0 16 0	0 16 0	7 1 2	37 81	43 0	7 3 9	3 15 4	0 6 2	7 60	0 16 3	0 15 0	1 11 3	0 5 9	..	
	Common Salt, .	..	..	2 0	0 0 9	0 1 6	0 1 6													
	Animal Charcoal,	..	..	1 0	0 4 0	0 4 0	0 4 0													
	Sulph. of Magnesia	..	..	0 56	0 8 0	0 4 0	0 4 0													
							1 5 6													
20.	Potash (Common,)	..	..	1 0	1 8 0	1 8 0	1 8 0	6 7 2	34 82	43 4	6 18 9	3 9 6	0 4 2	2 61	0 11 3	0 5 0	0 16 3	..	1 1 3	
	Common Salt, .	..	..	2 0	0 0 9	0 1 6	0 1 6													
	Animal Charcoal,	..	..	1 0	0 4 0	0 4 0	0 4 0													
	Sulph. of Magnesia	..	..	0 56	0 8 0	0 4 0	0 4 0													
							1 17 6													
21.	Animal Charcoal, dissolved in Sulphuric Acid,	..	..	1 0	0 4 0	0 4 0	0 4 0	7 5 3	38 2	43 12	7 14 4½	3 16 4	1 2 3	8 2	1 6 10½	0 16 0	2 2 10½	0 19 4½	..	
	Mur. of Ammonia,	..	..	0 56	0 14 0	0 7 0	0 7 0													
	Carbonate of Soda,	..	..	0 28	0 16 0	0 4 0	0 4 0													
	Sulph. of Magnesia	..	..	0 28	0 16 0	0 4 0	0 4 0													
	Carbon. of Magnes.	..	..	0 28	0 8 0	0 2 0	0 2 0													
		..	..	0 28	0 10 0	0 2 6	0 2 6													
							1 3 6													
	Peat Ashes* in Bushels, .	..	..	80	..	Probably	0 0	7 1 2	46 71	41 0	7 2 6	4 13 3	0 6 2	16 50	0 16 3	1 12 9	2 9 0	1 9 0	..	Ten days later of being top-dressed.

* See Analysis of Peat Ashes in Appendix.

Table F.—Exhibiting the Results of the Application of Special Manures to the Turnip Crop upon the top of the Dung in the Drills. All calculations made on the scale of One Imperial Acre. Turnips valued at L.1 per Ton. Common Manure, Turnips, and Potatoes, estimated by the Ton and its sub-divisions—Grain, per Quarter and sub-divisions—Hay and Straw, per Cwt. and sub-divisions—Special Manures, per Cwt. and sub-divisions.

		General Previous State of the Soil.				Application of Special Manures *Mentioned in Column 1st.*				Effects of Special Manures.		Economical Results of the Application of Special Manures.				
No.	Substances Employed.	Nature of the Soil.	Previous Culture or Treatment.	Quantity of Farm-Yard Manure.	Value of ditto per Ton.	Quantity of Specific Manure.	Cost of ditto per Cwt.	Cost of ditto per Acre.	Cost per Acre of both Common and Special Manure.	Produce in Bulbs.	Value of Bulbs.	Excess of Produce of Bulbs.	Value.	Gain from the Application	Loss from the Application	Remarks.
				tons.	L. s. d.	cwt. lbs.	L. s. d.	L. s. d.	L. s. d.	tons. cwt. lbs.	L. s. d.	tons. cwt. lbs.	L. s. d.	L. s. d.	L. s. d.	
1.	Farm-Yard Dung,	Stiff Clay Loam. See Analysis, No. 1, F, Appendix.	Beans after trenched Lea.	35	0 7 0	„	„	12 5 0	12 5 0	29 10 0	29 10 0	„	„	„	„	Sown 11th May, lifted end of October.
2.	Farm-Yard Dung,			18	0 7 0	„	„	6 6 0	6 6 0	34 19 0	34 19 0	5 9 0	5 9 0	9 18 0	„	Sown 13th, do.
	Peruvian Guano,			„	„	3 0	0 10 0	1 10 0	1 10 0							
									7 16 0							
3.	Farm-Yard Dung,	„	„	18	0 7 0	„	„	6 6 0	6 6 0	30 7 0	30 7 0	0 17 0	0 17 0	5 9 0	„	Sown 14th, do.
	African Guano,	„	„	„	„	3 0	0 9 0	1 7 0	1 7 0							
									7 13 0							
4.	Sheep Dung from Sheds,	Ibid. 2 F.	Wheat Stubble.	30	0 7 0	„	„	10 10 0	10 10 0	32 3 0	32 3 0	2 13 0	2 13 0	4 8 0	„	Sown 20th, do.
5.	Farm-Yard Dung,	„	„	18	0 7 0	„	„	6 6 0	6 6 0	21 7 87	21 7 9	„	„	„	1 19 9	Do.
	Common Salt,	„	„	„	„	2 0	0 0 9	0 1 6	0 1 6							
	Carbon. of Mag.	„	„	„	„	0 56	0 10 0	0 5 0	0 5 0							
	Bone Liquor from Boiled Bones,	„	„	„	„	500 Galls.	„	„	„							
									6 12 6							

Table F.—(*Continued.*)

No.	Substances Employed.	GENERAL PREVIOUS STATE OF THE SOIL. Nature of the Soil.	Previous Culture or Treatment.	Quantity of Farm-Yard Manure.	Value of ditto per Ton.	APPLICATION OF SPECIAL MANURES *Mentioned in Column 1st.* Quantity of Specific Manure.	Cost of ditto per Cwt.	Cost of ditto per Acre.	Cost per Acre of both Common and Special Manure.	EFFECTS OF SPECIAL MANURES. Produce in Bulbs.	Value of Bulbs.	ECONOMICAL RESULTS OF THE APPLICATION OF SPECIAL MANURES. Excess of Produce of Bulbs.	Value.	Gain from the Application	Loss from the Application	REMARKS.
				tons.	L. s. d.	cwt. lbs.	L. s. d.	L. s. d.	L. s. d.	tons. cwts. lbs.	L. s. d.	tons. cwts. lbs.	L. s. d.	L. s. d.	L. s. d.	
6.	Farm-Yard Dung,	Stiff Clay Loam. See Analysis, No. 1, F, Appendix.	Beans after trenched Lea.	14	0 7 0	–	–	4 18 0	4 18 0	25 14 37	25 14 3	–	–	2 3 6	–	Sown 20th May, lifted end of October.
	Sugar Scum, price not known, probably 10s. 3d. per ton, . .			–	–	40 0	0 0 6	1 0 0	1 0 0							
	Sulphate of Soda,		,,	–	–	1 0	0 8 0	0 8 0	0 8 0							
									6 6 0							
7	Farm-Yard Dung,	,,	,,	14	0 7 0	–	–	4 18 0	4 18 0	30 3 59	30 3 6	0 13 59	0 13 6	6 14 0	–	Sown 24th, do
	Peruvian Guano,	,,	,,	,,	,,	2 0	0 10 0	4 0 0	4 0 0							
	Common Salt, .	,,	,,	,,	,,	2 0	0 0 9	0 1 6	0 1 6							
	Gypsum, . .	,,	,,	,,	,,	2 0	0 2 6	0 5 0	0 5 0							
									6 4 6							
8.	Farm-Yard Dung,	,,	,,	14	0 7 0	–	–	4 18 0	4 18 0	27 11 45	27 11 3	–	–	4 3 9	–	Do.
	African Guano,	,,	,,	,,	,,	2 0	0 9 0	0 18 0	0 18 0							
	Common Salt, .	,,	,,	,,	,,	2 0	0 0 9	0 1 6	0 1 6							
	Gypsum, . .	,,	,,	,,	,,	2 0	0 2 6	0 5 0	. 5 0							
									6 2 6							
9.	Moss saturated with Urine from the Tank, probably worth 2s. 6d. per Ton,	,,	,,	60	0 2 6	–	–	7 10 0	7 10 0	34 0 93	34 0 9	4 10 93	4 10 9	9 5 9	–	Sown 27th, do.
10.	Animal Charcoal, Dissolved in Sulphuric Acid,	,,	,,	,,	,,	2 0	0 4 0	0 8 0	0 8 0	25 1 0	25 1 0	–	–	5 19 6	–	Sown 29th, do
		,,	,,	,,	,,	1 0	0 14 0	0 14 0	0 14 0							
	Animal Charcoal dry, . . .	,,	,,	,,	,,	2 0	0 4 0	0 8 0	0 8 0							
	Gypsum, . . .	,,	,,	,,	,,	2 0	0 2 6	0 5 0	0 5 0							
	Common Salt, .	,,	,,	,,	,,	2 0	0 0 9	0 1 6	0 1 6							
									1 16 6							

Table G.—Exhibiting the Results of the Application of Special Manures to the Turnip Crop after the Drills were formed. All calculations made on the scale of One Imperial Acre, and Swedish Turnips valued at L.1 per Ton. Common Manure, Turnips, and Potatoes, estimated by the Ton and its sub-divisions—Grain, per Quarter and sub-divisions—Hay and Straw, per Cwt. and sub-divisions—Special Manures, per Cwt. and sub-divisions.

		GENERAL PREVIOUS STATE OF THE SOIL.				APPLICATION OF SPECIAL MANURES *Mentioned in Column 1st.*			EFFECTS OF SPECIAL MANURES.		ECONOMICAL RESULTS OF THE APPLICATION OF SPECIAL MANURES.				
No.	Substances Employed.	Nature of the Soil.	Previous Culture or Treatment.	Quantity of Farm-Yard Manure.	Value of ditto per Ton.	Quantity of Specific Manure.	Cost of ditto per Cwt.	Cost per Acre of both Common and Special Manure.	Produce in Bulbs.	Value of Bulbs.	Excess of Produce of Bulbs.	Value.	Gain from the Application	Loss from the Application	REMARKS.
				tons.	L. s. d.	cwt.	L. s. d.	L. s. d.	cwt. qr. lbs.	L. s. d.	cwt. qr. lbs.	L. s. d.	L. s. d.	L. s. d.	
1.	Farm-Yard Dung,	Stiff clay	Wheat	20	0 7 0	...	...	7 0 0	21 7 71	21 7 6					All Sown 4th June, lifted end of October.
2.	Peruvian Guano,	loam. See	Stubble.	...	...	6	0 10 0	3 0 0	25 3 67	25 3 6	3 15 108	3 15 9	7 15 9		
3.	African Guano,	Anal. App.	...	...	...	6	0 9 0	2 14 0	21 5 0	21 5 0	...	...	5 16 6		
4.	Animal Charcoal,	No. 2 F.	...	...	...	10	0 4 0	2 0 0	19 11 0	19 11 0	...	...	3 3 6		
5.	Peat Ashes, probably 2s. 6d. per ton, (not more,)	...	...	20	0 2 6	...	...	2 10 0	20 3 64	20 3 6	...	...	3 6 0		
6.	Rape-dust,	...	...	...	...	15	0 6 0	4 10 0	18 9 32	18 9 3	...	...	...	0 14 3	

Table H.—Exhibiting the Results of the Application of Special Manures used as Liquid for Steeping the Seed. Oats at 2s. 6d. per Bushel—Oat Straw at 2s. per Cwt. All calculations made on the scale of One Imperial Acre. Barley sold at 3s. 5d. per Bushel and Barley Straw valued at 1s. 6d. per Cwt. Common Manure, Turnips, and Potatoes, estimated by the Ton and its sub-divisions—Grain, per Quarter and sub-divisions—Hay and Straw, per Cwt. and sub-divisions—Special Manures, per Cwt. and sub-divisions.

		General Previous State of the Soil.		Application of Special Manures *Mentioned in Column 1st.*	Effects of Special Manures.					Economical Results of the Application of Special Manures.			
No.	Substances Employed.	Nature of the Soil.	Previous Culture or Treatment.	Cost per Acre of both Common and Special Manure.	Produce of Grain per Acre.	Produce of Straw per Acre.	Weight of Grain per Bushel.	Value of the Grain Crop.	Value of the Straw Crop.	Excess of Produce in Grain.	Excess of Produce in Straw.	Value of Excess in Grain.	Value of Excess in Straw.
				L. s. d.	qr. b. p.	cwt. lbs.	lbs. oz.	L. s. d.	L. s. d.	qr. b. p.	cwt. lbs.	L. s. d.	L. s. d.
1.	Barley, English White, without being Steeped, .	Medium Loam.	Potatoes.	„	8 2 1	45 84	54 0	11 7 6	3 8 7½				
2.	Campbell's Steep,	„	„	0 12 0	7 5 2	48 24	52 8	10 12 82	3 12 0				
3.	Steep No. 1, . . .	„	„	0 9 6	7 7 1	53 24	55 8	10 16 1	3 19 6				
4.	Pure Water Steep,	„	„	„	8 0 3	47 16	53 0	11 2 3	3 10 6				
5.	Oats, Sandy's, and Oats without being Steeped, .	Light Loam.	Trenched with Spade from Lea.	„	7 0 1	47 29	41 0	7 0 7½	4 14 6				
6.	Campbell's Steep, four Bushels per Acre of Seed, .	„	„	0 9 0	7 3 2	47 96	41 8	7 8 9	4 15 6	0 3 1	0 67	0 8 1½	0 1 0
7.	Steep No. 1, . .	„	„	0 9 6	7 6 3	51 48	41 12	7 16 10½	5 2 6	0 6 2	4 19	0 16 3	0 8 3
8.	Steep No. 2, . .	„	„	0 9 6	7 5 1	55 80	42 8	7 13 1½	5 11 6	0 5 0	8 51	0 12 0	0 17 0
9.	Pure Water, . .	„	„	„	7 3 0	48 55	41 6	7 7 6	4 17 0	0 2 3	1 26	0 6 10½	0 2 6

REMARKS ON THE FOREGOING TABLES.

Remarks on Table A.—The field upon which the above experiments were tried contains about 16 acres of stiff clay loam, superincumbent upon sandstone rock: it is very flat, but was thoroughly drained some years ago with tile drains, 12 feet apart and 30 inches deep, and is now quite dry. It is worth 50s. per acre of rent. The previous culture was—1st year, oats from lea; 2d year, green crop, potatoes, and turnips; 3d year, oats sown down with rye-grass, clover, and natural grasses; 4th year, hay, of which this is the produce. The twenty experiments with the special manures, as applied to it this season, have not given so great an increase as I anticipated, owing to the hay being eaten down rather late by a heavy stock of sheep and lambs in spring, and the long-continued drought which prevented the various manures from acting as they would have done had there been more rain to have carried them down to the roots of the grasses; still, with all these disadvantages, it will be seen from the tables that the greater proportion have paid the expense of their application and left a clear gain. Each of these applications were repeated upon two plots, each one square rood, (imperial,) every portion being cut, (dried,) winned, and weighed by itself, and the average weight of the two taken as the true produce. No dressing, No. 1, viz. 26 cwt. 64 lbs. was the average produce of four roods, one upon each side, and one in the centre of the land under experiment, the average of the four being taken as the true produce. The gain from the different dressings was taken as follows:—The expense of the dressing was deducted from the value of the excess of produce, the remainder being the clear gain; and the loss from the application was ascertained as follows, viz.:—When the value of the excess of produce did not amount to the value paid for the dressing, the deficiency was set down as a loss, (that is,) the extra produce not having paid for the expense of the application. After the hay was cut and the land got rain, a very heavy aftermath came away upon all the portions dressed, but particularly from those portions upon which the mixtures were put on, viz., from No. 13 to 20; but, from being eaten down by sheep, the superiority of one dressing over another in the aftermath can only be estimated from appearance—every portion of the dressed is, however, better than the undressed parts of the field. The defects of these experiments are—1*st*, The field was severely and too long eaten down by the sheep and lambs in the spring; 2*d*, The dressings were too late in the season of being put on; and, 3*d*, The season, on the whole, was too dry to bring out fully the effects of the dressings. I would advise, therefore, from my experience in

dressing grain and hay crops, that all top-dressings of special manures should be sown upon the land the latter end of March or beginning of April, as there is a greater chance of plenty of rain at that time than later in the season, to wash them down to the roots of the plants; and it is not advisable to put them on too early, as they may be dissipated in part before vegetation has commenced. A very good criterion of the best time to top-dress grass-lands is when the plants begin to grow in spring, which may be earlier or later according as the season is good or bad, moist and warm, or otherwise. I have omitted mentioning the appearance of the effects that the different special manures produce on the grass from time to time, as I am satisfied that the appearances do not indicate correctly the amount of good or otherwise effected by these top-dressings. I may, however, mention that all ammoniacal salts, as well as those that contain nitrogen, have universally the effect of producing a dark-green colour, and apparently a more luxuriant foliage, and this remark applies to all cultivated crops, whether grass, potatoes, or grain.

Remarks on Table B.—The field upon which the above dressings were experimented upon extends to between 9 and 10 acres; is a good sound loam, inclining to clay; subsoil clay and gravel, and is nearly quite level; it was thoroughly drained with tiles some years ago, and is quite dry. The sward is composed of a great many varieties of the finer grasses; it had lain eleven years in grass, and, previous to 1843, was grazed with sheep, of which it carried a good stock; in 1843 it was top-dressed with various manures; cut for hay, when it gave a very large crop, averaging all over fully 300 stones, of 22½ lbs. each per acre; the aftermath was particularly good, carrying a heavy stock of sheep all winter, till the 20th April this season, when it was measured and divided into ¼ of an acre imperial, and the top-dressings mentioned in the tables were sown upon it, and was again cut for hay, of which the account is given in these tables. Owing to being so late in the season of taking the sheep off, combined with the lateness of the top-dressing and dryness of the season, the quantity of hay was not so great as it would have been had the dressings been put on earlier, when there would have been a greater chance of moisture to carry them down to the roots of the grasses; as it was, however, most of the dressings lay upon the top of the grasses, burning them, in some instances partially, of which they soon recovered when rain came. The aftermath was particularly strong and good on the portions which were dressed, whilst the portions which were left undressed, for comparison of the effect, looked yellow, stunted, and miserable. I may mention that No. 1, no dressing, is the average of three roods upon three sides of the

field, and that each of the other dressings were repeated upon two roods situated in different parts of the field, and the average produce of the two taken as the true produce. The gain or loss from the applications were found in the same manner as those upon the rye-grass hay. (See further remarks upon dressings, Table A.)

Remarks on Table C.—The field upon which the above potatoes were grown is a very stiff clay loam, upon sandstone on the east side, and of a light loam upon the west side, upon trap. The experiments were repeated upon both sides of the field, and the average taken of them as the true produce from the manures. The field was all spade-trenched sixteen inches deep, and the subsoil brought to the top in the winter of 1842–43, from which a crop of oats was taken in 1843, and it was fallowed with the plough in the winter of 1844, and properly worked and cleaned with plough, grubber, and harrows in April, after which the ground was drilled with the double-mould plough. I may here remark that, owing to the spade-trenching and grubbing, the land was so clean that I did not require to hand-hoe or weed the potato crop, and it is now without a single root-weed. As the land was drilled, farm-yard manure was spread in the drills in the proportions stated in the tables, except Nos. 10 and 11, after which the different special manures were sown broadcast, or spread in the drills as evenly as possible; cut seed-tubers were then laid, and the whole covered about three inches deep. The sets all came through the ground about the same time, except Nos. 10 and 11—which was owing to the drills being made all one depth over this field—and the small quantity of the two guanos used not raising the seed so near the surface of the ground, they were, consequently, longer of coming through. These two numbers came also very irregular, in consequence of the cut-sets being laid upon the top of the guano, which burned and killed many of them, and these had to be replanted. The crop all over the field was very healthy and strong in growth all the season, and had no wants in the drills except a few that were taken out by the crows. They continued to grow until cut down by the frost, and there seemed no great difference in appearance of strength or vigour in the one manure over the other. The way in which the gain or loss from the application was estimated was as follows:—Twenty-five tons of farm-yard manure were taken, as being the usual quantity allowed for an acre in this locality, costing £8 : 15s.; wherever any of the manurings exceeded this sum, the amount was subtracted from the extra produce, the remainder was the gain, and wherever the manuring did not cost that sum, the difference was subtracted from it and added to the gain, except in Nos. 10 and 11, as both of these costing less in price

for manure and had less produce, there was no standard of comparison. The whole seed used for this field, which were cut-sets, were strewn with gypsum in powder, as they were cut, and planted immediately thereafter. It is worthy of remark that the potatoes used for seed in this field were all grown upon this farm last season, when they were top-dressed with mixtures of sulphates of magnesia, soda, and ammonia, nitrate of soda, and common salt, and had been carefully preserved during the winter, when lifted from the pits, for planting. This season they had a particularly healthy appearance, the eyes being deep and fresh, without any appearance of disease; and wherever these potatoes were used for seed, either on this or the neighbouring farms, they grew with particular vigour, and no failures took place among them. I may further notice that the potatoes from which these healthy seed-tubers were grown were far from being in a sound state before they were top-dressed in 1843; and to the effect of these dressings, therefore, the soundness and vigourous growth of these potatoes this season can only be attributed—and this effect, from some previous trials in former years, on a small scale, I in some degree anticipated. Many remedies have been proposed to prevent failures in the potato crop, among which that of raising them from seed has been much insisted upon; but after ten or twelve years' trial, during which many thousand plants have been raised, I have failed in producing even one healthy variety, which seems to prove that the disease is inherent in the plant, and, this being admitted, it follows, of course, that seed saved from such plants cannot be expected to give a healthy progeny, and, therefore, we must look to some other mode of raising healthy varieties of potatoes than that from seed. The above observations on top-dressings, having been noticed for some years to induce greater vigour and healthiness, I think, might be taken advantage of, and by a judicious continuance of these dressings, from year to year, such a vigour might be imparted to the constitution of some of the finer old varieties, which are most liable to fail, that failures would no longer be heard of. It appears that the influence these dressings have had in imparting vigour to potatoes continues for more than one year, in consequence, probably, of their imparting to the plant some ingredient which is necessary to the healthy formation of seed-tubers, and thus enable them, upon being planted in spring, to push away healthy and vigorous shoots; whilst at the same time it confirms an observation that has been often made, that the unhealthiness and liability of the potato crop to fail, is principally caused by a deficiency in the soil or manure of some ingredients which they require for the maturing of a perfectly healthy crop. An ultimate analysis of healthy and un-

healthy potatoes would go a great way in either refuting or confirming the soundness of these views. It will be remarked that experiments Nos. 10 and 11 prove that guano should not be allowed to come in contact with the potato cuts, as it is apt to burn them, and frequently it destroys the young shoot altogether.

Remarks on Table D.—The potatoes upon which the above special manures were tried as top-dressing were grown upon a portion of the same field as those mentioned in Table C, and in which the results of special manures are recorded as being applied in the drills at the time of planting, so that the same remarks apply to this in regard to soil and exposure. The potatoes were planted in the usual manner, with the plough in drills. When the farm-yard dung was applied as usual in the drills, the seeds (cut-sets) were laid upon the top of it and covered up; two imperial acres were measured off into squares of twenty poles each, upon which the seven different mixtures were used as top-dressings upon 7th June; two portions, one on each side, being left undressed, of which the average was taken as the true produce of farm-yard dung alone. The same was done with the portions top-dressed, No. 2 on one side of the measured ground being No. 9 on the other side, &c., and the average of the two portions of twenty poles each, dressed alike, from the different sides of the ground taken as the true produce. The dressings were put on during the time of rain, and as soon after as the ground would admit of the crop being worked, the drill-grubber was put through between the drills, and the earth was set up to the plants with the double-mould board plough. All the dressings except No. 7 had the immediate effect of altering the colour of the foliage to a dark green, accompanied with a vigorous strong growth, which they continued to have till the crop was ripe—No. 4, soot, ripening first, then No. 1, dung, No. 6, African guano, next Nos. 2 and 3, 5 and 7, continuing to grow longest. It is also worthy of remark that, when lifted, those portions which were first ripe had the largest quantity of small potatoes. No. 7 had very large potătoes, and were by far the largest and best grown of any of the portions, but they are all of the finest quality for family use. After a number of years' experimenting with mixtures such as those given in the tables, I have come to the conclusion that, in moist seasons, these dressings, put on in a judicious manner, upon the potato crop, in an early stage of their growth, will add considerably to their produce, not only paying their cost, but leaving a considerable profit; whilst they are at the same time a most valuable addition to the farmer, whose potato crop (from causes over which he has little or no control) comes up weak and deficient in vigour and strength. He may, by a timely applica-

tion of these mixtures, invigorate the plants and cause them to give a fair crop, which, without their assistance, would have been nearly a failure. It has also been found, after four years' experience with top-dressing, that potatoes so top-dressed, if kept for seed, are much less liable to fail, come up through the ground with more vigour, and, consequently, give a larger crop than the same seed from undressed potatoes.

Remarks on Tables E.—The field upon which these experiments were made contains about 25 imperial acres, lying on the side of a hill with a very considerable slope to the north, and is open upon all sides. It is nearly all alike in point of quality of soil, and particularly that portion of it which was selected for making the experiments. It is a medium loam, about from 6 to 9 inches deep; subsoil a remarkably stiff yellow till, full of stones, and had lain in pasture partially drained for about nine years, during which period it was mostly grazed with a sheep stock. In the winter of 1843 and 1844, it was all thoroughly drained with tiles, at the distance of 30 feet apart from each other, in the direction of the natural fall of the hill, and 30 to 48 inches in depth. After being drained, it was all trenched with the spade and mattock 16 inches deep, and the subsoil brought to the top and laid quite level, all marks of ridge and furrow being taken away. In the process of trenching, an immense number of stones were taken out of it, from the size of an egg up to a ton or more in weight, many of which had to be blasted before they could be removed. The trenching cost L.3 : 6 : 8 per imperial acre. After the stones were all cleared off, it was sown with Sandy's oats about the middle of April, which brairded well and healthy, but suffered considerably from drought about the time the plants had exhausted the nourishment originally contained in the seed, and before the striking of their roots into the ground. Rain, however, came, when they very soon covered the ground with a healthy vigorous plant. About the beginning of May, a portion of the field was selected, as nearly equal as possible, which was measured out into portions of one rood each, when advantage was taken of heavy rains to apply the top-dressings. These, in every case where they contained nitrogen, had the effect of altering the colour to a dark green, and very much invigorated the strength and growth of the oats, and which portions continued to grow longer, and were later in ripening than any other portions of the field dressed or undressed. Nos. 8, 9, 10, 11, 20, 21, and 22, made no alteration of colour, and Nos. 8, 9, 10, 11, appeared to have stunted or burned the plants, which portions looked worse than the portions upon which nothing had been put.

Nos. 8 and 11 had the effect of making the straw very stiff and shining in appearance, and stood up well, and gave, as is seen in the table E, the greatest weight per bushel of grain; and it appears, from various other experiments upon this land, that common salt has invariably that effect, as also the carbonate of soda, now tried here for the first time this season. No. 7, rape-dust, had the effect of making the straw very coarse, with a thick watery stem, with broad coarse leaves, and does not appear well suited as a top-dressing for oats upon this land. It will also be seen from the table that Nos. 2, 3, 4, 5, and 6, had the same effect this season as formerly, when used by themselves, of giving a considerably increased crop of straw and also of grain; but the grain so grown, particularly that with dressings, Nos. 2, 3, and 4, is greatly deficient in weight per bushel, while the whole crop from their application is more liable to be laid, which, in a wet season, would cause considerable loss. In looking over the tables, it will be seen that all the mixtures have added considerably to the produce, and it is advisable at all times, when ammoniacal salts are used as a top-dressing for grain crops, to mix them with inorganic substances, such as the phosphates, common salt, sulphates, and carbonate of soda, &c., as these substances have been found to detract nothing from the vigour which all ammoniacal salts impart to the grain crops, whilst they add considerably to the weight per bushel, and enable the plants to come better to maturity without being laid down. From experiments upon a small scale, it has been found that silicate of potash, added to the ammoniacal salts, has the very best effect in strengthening the straw; but the high price at which it is sold, and the difficulty of making it upon the farm, without the necessary apparatus, has as yet prevented it from being tried upon such a scale as would warrant us in coming to a conclusion upon its merits. No. 20, in which common potash or black ashes were tried, has been used here in some instances with good effect; but the high price at which it is sold prevents its use to such an extent as would warrant us in arriving at a conclusion regarding it as a dressing for oats. No. 22, peat ashes, were made from burning flow moss in the open air, with the fire kept closely covered in. They were about ten days later of being put on the oats than the other dressings, and continued dry weather, for some time after they were put on, prevented them from having the effects they would have had, had they been put on earlier in the season. However, from their known composition, they are a most valuable dressing, and will, no doubt, add greatly to the fertility of most soils, and are particularly worthy of notice from the ease with which they can be produced in almost any quantity in every county in Scotland, and affording a source of

employment to the poorer classes of our own country, whilst adding considerably to the production of food.

Remarks on Table F.—The field upon which Nos. 1, 2, and 3, of these experiments were tried is about 3 acres of the same field upon which the experiments were made in growing potatoes, recorded in tables C and D, so that the same remarks apply to these three experiments as regard exposure, soil, drainage, working of the lands, &c.; these three portions being sown with Swedish turnips, which finished the cropping of this field. I have given the analysis of the soil of this field as made by Professor Johnston, in Appendix, No. 1, F, which will give a better idea of the quality of the soil than anything I can say upon it. I may, however, mention that it is a soil very difficult to bring into good tilth for green crops in either of the two extremes of wet or drought. At the time of sowing these, the weather was extremely dry, and the great and lengthened labour that the ground required to prepare it for the seed had the effect of drying it still more. The seed was sown as soon as the ground was put into order, but in consequence of what has been stated, it brairded very irregularly until rain fell, when the plants came away strong and equally, without a vacancy in the whole field, and continued to grow strong and vigorous all the season, during the prevalence of the strong drought in September. Mildew appeared upon the leaves of some of them in some parts of the field, but not upon one portion more than another. As soon as this disease made its appearance, a small subsoil plough was put through the drills as deep as a pair of horses could draw it, and which had the effect of loosening and shaking the soil about them. After this was done the mildew disappeared immediately, the turnips commenced a second growth, and are now (the end of October) growing as vigorously as in the midst of summer. Although the leaves were completely met in 30-inch wide drills when this ploughing was given, very little damage was done to the crop by the horses, one being yoked before the other, and the foremost horse carefully led by a man. A sufficient portion only was taken up in different parts of each of the experiments, so as to ascertain with sufficient accuracy the different weights of produce on the different manurings, as a very heavy loss would be incurred by lifting the whole crop, which is growing vigorously, in consequence of this late ploughing. The only other remark worthy of notice in the action of the different manures upon the crop is, that No. 1, farm-yard dung, had the least tops of any of the three manurings. No. 3, farm-yard dung and African guano mixed, had medium tops; and it appears, from the

present state of the crop, that the effects of this guano is sooner exhausted than the Peruvian, No. 2, which had all the season the largest and most vigorous tops, and is now growing with as much vigour as ever. The field upon which the experiments Nos. 4 to 10 were tried is much of the same description of soil as those upon Nos. 1 to 3, and was managed, as regards the working, in the same manner as the potatoes and Swede turnips of the other field. An analysis of this soil by Professor Johnston is given in the appendix, No. 2, F. The field is bounded on the west by a plantation; the other sides are exposed, and the field is nearly level. It was thoroughly drained some years ago, and is quite dry. The last year's crop was wheat, the stubble of which was fallowed in the end of 1843. The sowing of the Swedes upon this field followed one after the other, as will be seen by the dates in the tables, as fast as the ground could be got thoroughly worked; but although rather later in the season of being put in, there was little difference in the brairding, owing to the continued dry weather. However, when rain did fall, they brairded vigorously, without a vacancy in any of the portions. Three acres were measured off for these different manurings, in portions of one rood each, and the same manurings applied on two portions on different sides of the field. There was a greater difference to be observed in the six portions in tables Nos. 4 to 10, than in the three first in table F. No. 9 F,* moss saturated with cows' urine from a tank, came first through the ground, and the plants had a very dark green colour, whith they continued to keep all the season, and which completely marked them out from the rest of the portions. No. 4, sheep-dung, which was next in point of earliness in brairding, was taken from the sheds in which ewes and lambs had been hand-fed with oil-cake, oats, pease, and lea-hay, during spring, and it was very moist when put in the drills. The turnips were also dark coloured on this manure, but not so much so as No. 9. No. 10 also came quickly through the ground. All the others came much about the same time. Nos. 4, 7, and 8 had by far the strongest tops of any of these manurings; and the same remarks apply to No. 8. African guano, as given above, appearing to be sooner exhausted than the Peruvian, No. 7. Nos. 5, 6, and 10 had the smallest tops of any, particularly No. 10, which had very small tops and large evenly-sized bulbs. Nos. 5, 6, bone boilings and sugar-scum, which are noticed, and an account given, in tables C, being only used here this season for the first time, little can be said about them. They are, however, worthy the attention of agri-

* The turnips manured with the mixture of urine and moss were infected with the disease called "fingers and toes" more than any other part in the field.

culturists—the sugar-scum, being a vegetable production, will probably be rich in materials suited for the growth of crops, and the bone boilings, from the source from which they are obtained, and being at present allowed to run to waste, warrants me in recommending them to attention.

Remarks on Table G.—The field upon which the experiments recorded in table G were made is from 2 to 3 acres of the same field upon which those experiments given in table F, viz., Nos. 4 to 10, were made, therefore the same remarks and analysis apply to both. (See appendix F.) I, however, considered it necessary to have a new standard of comparison for these, and put them upon a separate table, in consequence of their being a few days later of sowing than the others, and the quantity of farm-yard manure, No. 1, being considerably less—in fact, being another set of experiments to test the efficacy of these manures without mixture, in relation to a smaller quantity of dung, viz., 20 tons. In brairding, farm-yard dung took rather the lead of the others; but No. 2, Peruvian guano, after brairding, took the lead of the others, and kept it all season. They are all, however, a good crop, covering the drills completely, without a single vacancy occurring in any of the portions, and will be (if the weather is favourable for some time yet) a very heavy crop.

Remarks on Table H.—The part of the field upon which the steeped barley was grown is medium loam, with a gentle inclination to the east, superincumbent upon rotten trap; it was cropped with potatoes last year, and gave a large crop; it was ploughed in spring, when two imperial acres were measured out and divided into four portions as equal in quality of soil as possible, upon which the steeped grain was sown broadcast, and harrowed in immediately: four bushels of seed per acre were sown; it was very dry weather when it was sown, but the land having been trenched with the spade two years ago, and consequently being in fine tilth after the potato crop, which was well worked, the barley (steeped and unsteeped) all over the field brairded quickly, no difference being discernable in the brairding of either seed; but, after brairding, for about six weeks, there was a slight shade of difference, the plants from the seed steeped in Campbell's and the other steep, No. 1, being rather darker in colour and stronger than the others. This seeming superiority they soon, however, lost, and had it not been from the marks made at the dividing of the ground, it would have been impossible to have told that there had been any difference in the management of any of the portions; and this was completely confirmed when the grain was thrashed and weighed, that portion which

was not steeped giving more grain, but a little less straw, than any of the steeped portions. However, the difference in all these portions is so slight, that it may be fairly said that the steeps have neither added to nor decreased the produce. From extensive experiments for many years in the weighing of different portions of crops grown upon lands contiguous to each other, it has been observed that, circumstances being alike in the preparing the land and seed, differences, such as are given in the above table of steeps, in all cases that have come under my observation, have been found to be as great, both in quantity of straw and grain, as these have been. There is, however, a difference in the weight of the grain per bushel in the tables, which, in our present limited practice in steeping grain, it is very difficult to say whether it has been caused by steeping the seed or not; this will require to be repeated in various ways before a conclusion can be come to upon different descriptions of soil and previous management. It is very doubtful whether or not this difference in weight per bushel, in the present case, has not been influenced by the previous management of the potato crop in this field. Last year, for instance, it is evident that, in the manuring a field from the farm-yard, if this manure has not been intimately mixed before being taken out to the drills, the superiority of one part of the field over another would be considerable, and wherever a mixed stock is kept, the difference in the quality of the manure produced by them will be very great, and will be more than sufficient to account for the difference of the weight per bushel. In manuring a potato field in drills, it can easily be imagined that some drills may chance to get the dung from sheds where bullocks, arrived at maturity, are fed for the butcher upon oil-cake, turnips, grain, and hay, and which will be greatly richer in all the ingredients required for the food of plants, especially the alkaline phosphates, on which, we have reason to believe, the weight of the grain per bushel principally depends, than that of young stock which are seldom so highly fed, while, at the same time, they extract more of the inorganic ingredients, such as phosphates, &c., from their food, to build up their system, leaving their manure comparatively deficient in these substances; or even the dung of dairy stock, which, in the shape of milk, being mostly consumed off the farm, takes away from the manure the largest proportion of the alkaline phosphates contained in their food. Knowing these differences to be so great in the manure, from different descriptions of stock and modes of management, it will require, as mentioned before, more extensive practice in steeping seeds before a satisfactory conclusion can be arrived at. The steeped seed oats were grown

upon part of the same field on which those experiments upon oats with special manures were made, and the same remarks apply to this as are given in table E, as regards working and exposure; the soil, however, immediately where the steeped oats were grown, is of a lighter description, full of small whin stones—what is generally called a gravelly or stony soil. There was fully more difference in the brairding of the oats than in the barley, the steeped seed all brairding about two days earlier than the unsteeped, and it also continued for about six weeks or two months to keep this superiority; after this period, however, no difference was discernable, in point of colour or strength, of the steeped from the unsteeped seed, nor any degree of tillering in the one over the other, either in the barley or oats. One imperial acre of each of these steeped oats was tried with four bushels of seed to the acre. Upon examination of the tables of results it will be seen that all the steeps, even pure water from the burn, has apparently added to the produce, both in grain and straw; it is, however, so little, that no great value or influence can be ascribed to the steep except the impulse it may have given to the seed after being sown in brairding it quicker, and in a dry season, such as this was, enabling it to cover the ground quicker, and consequently to resist the drought better than the unsteeped seed; this will, in some measure, account in a dry season for a greater produce of straw and grain than the difference given in these tables. It has always appeared to me that the advocates of the system of steeping have been too sanguine in their expectations of the results which they pronounced would follow from this method of manuring, and which these trials have confirmed. The promulgators of these steeps appear to consider that, by steeping the gramineous seeds in certain chemical compounds, they may be made to produce greater and more certain crops than by the more rational method of applying the food which they require to the soil, which is well known to be the principal source from which they derive their inorganic ingredients. I, however, by no means wish to deny that steeping seeds is attended with some benefit; it has been practised too long by gardeners and others to leave any doubt that it is of the greatest use to steep many seeds, such as pease, &c, before sowing them, particularly during the hot dry months of summer, to promote a quick braird; but the effect of this is quickly gone, and if a sufficient supply of nourishment is not afforded by the soil, they would be sure to languish and die. The steeping of seed wheat has been known and practised for at least 100 years, and with good success, as a preventive of smut, &c.; but I never heard it asserted by those who used urine and salt as a steep, that they ever had a larger crop in consequence, although urine contains almost all that is required by plants;

and if it is still asserted by the advocates of steeps that it does all the good they say, and that no other manure is required to grow large crops of grains, let them prove this before they attempt to vend the nostrums which they prescribe at a large price, and thereby tend to bring science into disrepute. Campbell's steeps for barley and oats were purchased from one of his agents, and his printed directions as to the quantity of water and length of time to allow the seeds to lie in the steeps strictly followed, viz.—The barley lay in the steep 64 hours, when it was taken out in the morning and spread thinly upon a wooden floor, with a free circulation of air, and often turned during the time it lay, when it was sown in the afternoon, and harrowed in immediately. The oats lay in the steeps 72 hours, and were managed in the same manner, nothing being used to dry any of them. Steep No. 1 of the table was made as follows:—56 lbs. of animal charcoal dissolved in 28 lbs. sulphuric acid, and let stand in a tub for 48 hours, after which, carbonate of soda dissolved in water was added till all effervescence ceased; to the above was then added 14 lbs. sulphate of magnesia and 7 lbs. carbonate of ammonia, and let stand for 24 hours; it was then well stirred up and strained through a sack, and as much pure water was added as would cover the seed, 4 bushels of both barley and oats being allowed to the imperial acre. Steep No. 2 was the same as the above, with sulphate of ammonia instead of the carbonate, and the addition of a small quantity of the nitrate of soda.

Further Remarks in Conclusion.—In looking over table A, some very curious results will be noticed, such as after a top-dressing with 1½ cwt. nitrate of soda it gave 37 cwt. 8 lbs. in place, and in another part of the field the addition of ½ cwt. more per acre, gave 54 cwt. 48 lbs., or 17 cwt. 48 lbs. of increase, whilst upon the neighbouring portion of the field to that upon which the 1½ cwt. nitrate of soda was top-dressed, 1½ cwt. of sulphate of ammonia gave 48 cwt. of hay, or 10 cwt. 102 lbs. more than the same quantity of nitrate of soda; however, upon the addition of ½ cwt. more, or 2 cwt. in all, top-dressed upon the next portion to that upon which the 2 cwt. nitrate of soda was put, the produce was only 44 cwt. 64 lbs., or 3 cwt. 48 lbs. less per acre of hay than where only 1½ cwt. had been used, thus by the addition of ½ cwt. of the nitrate of soda, the produce was very considerably increased; the like addition of sulphate of ammonia gave 3 cwt. 48 lbs. less; this discrepancy in the different effects of these salts is not easily accounted for in a satisfactory way, possibly the dressing upon one part of the field had come in contact with more alkalis than in the other, and were in consequence decomposed quicker and rendered more

easily assimilated by the plants. Be this however as it may, it is certain that these two substances, and others of like description, have been applied to the hay crops upon this farm for the last four years upon every description of soil, when in not one instance have they been known to fail in giving large extra produce, paying their first cost and leaving a fair profit. Sal-ammonia, one of the dressings mentioned in the tables, gave an increase of hay, but from its high price (£3 per cwt.) it will not, after repeated trials, pay for its application to the hay crop. Rape-dust does not answer as a top-dressing upon this land, especially in a dry season, such as this was, and even the addition of common salt and nitrate of soda to it in small quantity has not in the present instance paid for its application. The two guanos (Peruvian and African) have answered well as top-dressings upon the hay crop at the rate of two cwt. per acre, and after deducting their expense from the excess of produce, they have given a considerable profit. I might go on enumerating one dressing after another, and a volume might be written upon them and not throw much light upon their action when used by themselves. These speculations I, however, leave for the present to the philosopher and man of science, accounting it sufficient for the practical man to know that there is not a doubt of their efficacy used as mixtures in certain proportions to particular crops applied in the manner stated. They have always been found to answer well upon this land, giving good crops of hay, in the first instance with abundant aftermath, enabling the fields to carry nearly double the stock they did before being so top-dressed. The top-dressing of the fields occasionally for grazing, is now, after a number of years' trials, reduced to a system, and enters into the economy of the farm here. By the aid of these substances applied to our fields we are enabled to keep more stock and in better condition, upon what was the most worthless of our pastures, than we could before this discovery do upon our best fields. I will particularize an instance or two of their beneficial effects upon old lea for grazing: A small field of seven imperial acres, which had lain about thirteen years in grass, was getting worse and worse every year; it was top-dressed this spring with a mixture composed of 1 cwt. Peruvian guano, 1½ cwt. common salt, and 1½ cwt. animal charcoal, at an expense of 17s. 1½d. per acre. This was sown upon it with the hand in the beginning of April. It was some time after that it got rain; however, when rain fell, it brought away a strong vigorous growth. Upon the 9th of May there was turned into this small enclosure six three-year-old Angus-shire polled bullocks, averaging at the time thirty-five imperial stones each, also two Ayrshire cattle, about the same weight, besides two one-year-old half-bred short-

horn and Ayrshire bullocks, in all ten head of cattle. Notwithstanding the severe drought which prevailed during the summer, it kept and fattened the six polled bullocks, which were sold in August for thirteen guineas, each averaging at that time forty-eight to fifty imperial stones. The Ayrshire cattle were taken in fat, in the middle of October, leaving the field still in good condition. This field, for the last four years before being dressed, carried and fattened only a stock of from five to six West Highland cattle of from twenty-five to thirty imperial stones each. Two other small fields, the one containing ten imperial acres of light soil upon freestone rock, the other, nine imperial acres of light loam upon rotten trap, by the application of the following substances mixed and top-dressed upon them, in spring, were enabled to carry a heavy stock of sixteen Ayrshire dairy cows giving milk, besides two short-horn cows and one of their calves, all the season, keeping them in prime condition. The butter made from the milk of this stock is considered of the first quality in the market, and always fetches the highest price. These fields keep about one cow per acre, whereas 2½ acres of this land formerly would not have grazed a cow and kept her in moderate condition. These cows were, however, kept in the byre at night, from eight o'clock to five next morning, during which time they had a feed of cut grass, vetches, or other green food. The mixture alluded to is 1½ cwt. Peruvian guano, 2 cwt. common salt, and 2 cwt. animal charcoal, costing in all 24s. 6d. per acre. Passing from these tables to table B, it will be seen that, except the two guanos, all the other dressings have been applied as mixtures in which animal charcoal forms a part. The success in every instance, and the large increased produce from every one of these dressings, tend, I consider, to confirm the truth of a remark that has been before made, that all the soil here requires phosphates and common salt; as also that the more compounded these mixtures are the greater the success of their application. Even in this dry season, when the application of top-dressings are uncertain, these dressings have, in every instance, paid for their first cost, leaving a profit, besides nearly doubling the produce, thereby enabling us to keep more stock in winter, which is the essence of all good farming, whilst the greatly increased aftermath, carrying nearly double the stock it did before, is due alone to their application to the hay crop, and all this good is effected without robbing the soil. I consider that when we apply nitrates and other salts containing ammonia only as top-dressings by themselves, there is no doubt that the ammonia contained in them enables the plants to assimilate more of the inorganic ingredients contained in the soil, producing a large crop for a season, but leaving the land, if something else (particularly the phos-

phates) be not applied, in very poor condition. This, however, cannot be the case upon the application of mixtures of the above description, as the inorganic food for an extra crop is supplied along with the ammoniacal salts. By the application of 1 cwt. of animal charcoal per acre, there is supplied about 80 lbs. of phosphate, which I consider is one, if not the principal, ingredient required in our soil, which is known to be deficient in phosphates, and perhaps most soils are, except those in the neighbourhood of large towns; and the striking success of the two guanos, I ascribe to the phosphates which they contain, as much, if not more, than to any other of their constituents. I do not wish, however, by this, to deny that the ammonia contained in them has a due share in promoting the growth of crops by enabling them to assimilate more of the inorganic ingredients than they would otherwise do; still I am inclined, from observation and experience in using these substances as top-dressings and manures, to ascribe the first importance to the phosphates; and further, it appears to me that we cannot increase the fertility of our fields by salts of ammonia alone, unless the necessary inorganic substances are applied at the same time; and as few if any soils contain a sufficient quantity of the phosphates—and even what of them they do contain is continually drawn away in the shape of beef, mutton, cheese, and grain of all descriptions, &c., which are mostly consumed off the farm—and there being no natural supply of them as there is of most of the other inorganic ingredients of the soil, I think we are perfectly warranted in putting them in the foremost rank of fertilizing substances; and what is more confirmatory of their importance is, that no seed of our cultivated crops can be formed without them; and a soil either deficient in or containing no phosphates, whatever its condition might otherwise be, would be quite incapable of producing grain crops. I consider the phosphates contained in town-made manure as the sole cause of the great fertility of the soils situated near towns, and that it contains a greater quantity than common farm-yard dung, which is continually robbed of its phosphates by being constantly carried to towns in the shape of food, and which enables the land round cities to carry continual crops of grain, &c., and its cultivators to follow such a rotation of cropping, as it would be impossible to do without reducing their land as much as such a system of cropping is found to do in that part of the country where the expensive carriage of town-made dung amounts to a prohibition. The only way, therefore, by which those at a distance can hope to rival the holders of land in the vicinity of towns, in the amount of produce, is the application of phosphates to their land in the shape of bones, animal charcoal,

and even fish bones, shells, &c., which contain an appreciable quantity of those salts; and I may remark that it is on soils so situated that the value of specific or artificial manures will be best seen and most appreciated. I can account in no other way for the efficiency of coal-ashes and night-soil, which are usually mixed in towns as a manure. No doubt they contain many ingredients besides the phosphates, as lime from the coal-ashes, &c., but we are almost certain that it cannot be from any nitrogen that was originally contained in the night-soil, as, by its mixture with the ashes, the whole, or at least the greater part of that must be driven off. Now town-made dung raises large crops of turnips, and even potatoes, (being better suited for the turnip crop,) after which follow excellent crops of grain and hay; whilst the pasture, after such manuring, has never been found inferior, other things being equal, to that which has had dung from the farm-yard. In making experiments with specific manures as top-dressings or in the drills, upon crops manured with farm-yard dung, it appears to me that the different qualities of that manure, from different descriptions of stock, have never been sufficiently taken into account in reporting such experiments as these. That there must be a great difference in the amount of fertilizing substances in the dung of animals arrived at maturity, and full fed, from that of growing young stock, I think there cannot be a doubt—the young animals requiring a great portion, if not all, of the phosphates contained in the food they consume for the growth of their bones; and, again, dairy stock, giving milk or in calf, will extract the greater proportion of the phosphates contained in their food, either for the supply of the milk or the healthy nutrition of the fœtus in the womb. These being the case, which I think will not be disputed in the present day, it follows that he who keeps a stock of bullocks to eat the produce and manure his fields with their dung, will have larger crops than he who applies manure from a dairy or young stock; so also results will be different where dung is made from a mixed stock of all the above descriptions from dung brought from towns. The description of food also upon which the stock is kept contributes to vary the value of the manure made from stock. He who uses oil-cake as food for his cattle, makes use of a far richer material for the food of plants than he who only feeds with turnips, straw, or hay. In like manner, the dung procured from towns must necessarily vary in quality from the different grades of society which inhabit them. The classes who live largely upon animal food must produce a manure richer in all the ingredients required for plants than those classes who are chiefly fed upon vegetable diet. From all these considerations,

it appears to me that, admitting we have correct analyses of soils, the different qualities of the manures we make use of will all require to be taken into account before we can sufficiently account for the discrepancies that appear in the reports that have yet been made upon the effects of special manure on the produce of farms under different systems of management.

In farther remarking upon the effects of top-dressing potatoes, I wish to impress it upon the attention of agriculturists, that, by judiciously applying these at a proper time, they have the means in their power of adding greatly to the produce—to an extent that will not only pay for the extra cost, but also leave a clear profit. It will also be found that if, at any time, the potato crop should come up weak and unhealthy, by their means (with no farther trouble than sowing them upon the tops of the drills during rain, after the potatoes are brairded) a healthy and vigorous growth will be ensured, and also, as is often the case, if the quantity of farm-yard manure to plant a field is so deficient as only to manure the half of it, the deficiency may be supplied by top-dressings, after the plants are through the ground, and they will give a remunerative crop, in most cases as large, if not larger, than if the full quantity of farm-yard manure, and probably more economically, had been applied. I make these remarks on the efficacy of top-dressings with perfect confidence, as their success upon this farm for the last four years, upon every description of soil, has fully proved. For practical purposes, I strongly recommend the application of mixtures of substances adapted to particular crops, such as mixtures for grain, and also for green crops, hay, &c. It may be objected to this mode of procedure, that we should first be certain of the absolute deficiency of the soil in these ingredients before we apply them. No doubt such a knowledge of the soil would be very desirable, but this is very difficult in practice, and is also a very uncertain way to find out the real deficiency, or otherwise, of any particular field; and as we already know the composition of certain families of plants, we have only to give the particular crop the particular food it requires. Suppose a soil to be deficient in the greater number of the ingredients which form the food of a particular plant, such a mixture will be attended with great benefit even though the soil may naturally contain a certain portion of the ingredients of the mixtures used in the top-dressing; for the dressing will enable the soil to produce greater and more certain crops than it could have done if the additional substances had not been applied. The greater quantity of available inorganic food applied to the soil for a specific crop, the larger crop may be expected from it.

From the experiments tried on this farm, the following practical conclusions seem tolerably certain :—

1*st*, That farm-yard manure and guano, half and half, or say 20 to 25 cubic yards of the former to 3 cwt. of the latter, will raise a better and heavier crop of potatoes or turnips than a full manuring of either by themselves, and at much less expense.

2*d*, That the land so manured is in as good condition, or indeed better, for the production of after crops than if manured with a full portion of farm-yard manure.

3*d*, That magnesia is necessary for the healthy growth of the potato, and must be added in the form of sulphate, carbonate, or phosphate, if not already in the soil.

4*th*, That most soils, except those near the sea, require common salt, which greatly improves most crops, and invariably renders grain crops heavier per bushel.

5*th*, That, as phosphoric acid, or the phosphates, so necessary for the maturing of most crops, particularly grain and good pasture, are carried off the land in grain, milk, &c., towards large towns, means should be taken to supply the loss with bone-dust, animal charcoal, or other substances containing phosphoric acid.

6*th*, That, from the quick and beneficial effects of bones dissolved in sulphuric acid on crops, it seems fair to infer that they require a considerable portion of this acid in a free state, ready at hand to be taken up either by itself or combined with magnesia or soda.

7*th*, That guano, or other substances containing much ammoniacal salts, should not, in general, be used by themselves without the addition of other matter, as they tend to give a large portion of soft straw and light grain in grain crops, and large growth of stems and leaves in green crops, without producing proportionable bulbs. If the soil be deficient in soluble inorganic matters, it will be found that neither it nor the atmosphere will be able to supply the carbon or other materials which the large increased surface of roots and foliage requires ; hence the soft straw, light grain, and deficient bulbs from the application of ammoniacal salts by themselves.

8*th*, That it may be set down as a general rule, that whatever be the component inorganic constituents of our cultivated crops, by procuring those substances from natural or artificial sources, and applying them in mixture, with or without farm-yard dung, we enable the soil to produce much larger crops, and of superior quality, than it could possibly do by the ordinary manurings. Increased food will always give increased bulk of plants and seed. This, however, has the limitation mentioned in 7th, viz. the inability of the soil and atmosphere to supply the necessary carbon, &c., to too greatly increased bulk of foliage in a given time —the short time our crops take to arrive at maturity.

9*th*, That, from the very variable effects of the different artificial compound manures (even on the same soil) now offered to agriculturists, it seems probable that they are not of uniform quality, and, even could this be depended upon, many of them would probably be found not applicable to all descriptions of soil. I would, therefore, suggest that ammoniacal salts, phosphates, and other salts and substances to be used, should be purchased separately, and mixed by the farmer in proportions suited to his particular crops, locality, or soil, and in this way each substance could be tested, and its real value ascertained before being mixed.

10*th*, That alkalis must be added to all soils in which they are deficient, and particularly to moss-lands, in the shape of silicate of potash or soda, alkaline silicates being indispensable for the healthy growth of straw, and consequently of grain. Mossy soils contain very little of these silicates, which is proved by the soft straw and light grain per bushel which they produce.

Analysis of the Soils upon which the Experiments recorded in Tables C, D, F, and G, were made, as also the three first experiments in Table F., made by Professor Johnston :—

	No. 1. Tables C, D, and 1st 3 of F.	No. 2. Tables F,
1. By Washing.		
Clay,	73.69	62.27
	100.00	100.00
2. By Analysis.		
Fine Siliceous Sand (with small stone in No. 1,)	26.31	37.16
Organic Matter,	10.43	12.05
Salt soluble in water (chiefly sulphates,)	0.75	1.23
Oxide of Iron,	10.78	5.73
Do. of Manganese,	0.24	0.19
Alumina,	2.87	4.69
Carbonate of Lime,	1.41	1.12
Do. of Magnesia,	Trace.	Trace.
Phosphoric Acid,	Trace.	Trace.
Siliceous Matter and Clay,	73.21	74.37
	99.69	99.38

Analysis of Peat-ashes used in No. 22 of Table E :—

Organic Matter,	3.02
Sulphate and Carbonate of Potash, Soda, and Magnesia,	5.16
Alumina,	2.48
Oxfera,	18.66
Sulphate of Lime,	21.23
Carbonate of Lime,	3.07
Phosphoric Acid,	0.19
Insoluble,	43.91
	98.36

REPORT ON RECENTLY INTRODUCED CONIFERÆ.

By Mr Robert Locke, Gardener to Archibald Hamilton, Esq. of Rozelle, Ayrshire.

[Premium—Medium Gold Medal.]

The introduction of new coniferous plants is an object of great importance to a country like this, not only with a view to the improvement of its natural scenery but for the purposes of economy. To suppose that a better species does not exist in the world than those already in our possession is the conviction of prejudice, and is at variance with fact.

I conceive it proper, at the outset, to observe that the greater proportion of our recently introduced pines are planted in and about the pleasure-grounds at Rozelle, which are situated within one mile of the sea, but, being sheltered by older plantations, are not greatly exposed to its storms. The soil is not of the best description, being light and sandy, lying upon a subsoil highly impregnated with the oxide of iron. Where any of the plants mentioned happen to occupy a different soil or situation, I will refer to it, and point out the difference.

Pinus sylvestris, or Scots Fir.—Of this species I only speak for the sake of contrast with those not so well known in the country, and may therefore say, in a word, that although we do not find trees of large dimensions in the Scots fir plantations of this locality, yet all the timber I have seen cut down has been of excellent quality, and the young plantations are thriving remarkably. The average annual shoots are from 18 inches to 2 feet.

Pinus sylvestris, var. haguenensis.—This pine, of which we received a few hundreds from Messrs P. Lawson and Son, Edinburgh, in 1837, is taking the lead of all our varieties of the Scots fir. The yearly growths are longer, and the colour more lively green. They are planted side by side with the common firs, from which they are readily distinguished. The soil in which they are planted is stiff and cold, different from the case of the greater part of our pines. They are likewise in a higher altitude, and more exposed.

Pinus ponderosa.—This noble tree we find to be perfectly hardy, and everything connected with it here supports the hypothesis that it will ultimately prove a very valuable timber tree in the climate of Scotland. Our specimens are 16 and 18 feet in height, and very proportionate in strength both of stem and branches. The average growths are 3 feet per annum. The leaves are long and altogether of a very ornamental description. I would here refer to a very grievous complaint urged against

this plant, which is, that it will not support itself in the soil unless in a very sheltered situation. But, from circumstances which have come under my own observation, in the case of one of our plants, I am inclined to think that its want of what may be termed *storm stays* arises more from the treatment of the seedling in the early stages of its growth than from any defect in the plant itself. The tree in question had been kept for a considerable time in a small pot, and, as a natural consequence, the roots had formed themselves into a complete ball, which, in planting out, were found to be impossible to be unravelled without tearing and twisting the roots. Another plant, put out at the same time, but which had not been so long in confinement, and its roots consequently in a more pliable state, spread all round the pot in which it was placed.

Of these two, the one with the matted ball of roots did not stand well for several years, while the other maintained itself from the first. There is another evil in the case of planting pines, or any other timber tree with matted balls, viz., the barking of the roots, which is often the cause of the death of the plant. A tree may lose a part of its roots by being overturned by the blast and still support its vitality by the few that remain ; but when the main roots are barked at their junction with the ascending stem, it is hardly possible the plant can survive. My opinion therefore is, that the remedy often applied is worse than the disease, or, at all events, as bad. To support a tree or plant of any kind, whose natural habitation is the stormy hills, by stakes or cords, must prevent in a great measure that freedom and exercise so requisite in the maintenance of a proper circulation of sap through all the parts of the plant. My system, when I do resort to propping, is to secure the roots, leaving the heads at perfect freedom. *Pinus ponderosa* is the only one of those pines allied to the Scots fir that has with us been attacked by insects, and these I conjecture to be the *Curculio pini*, or pine weavel. Its attack is generally upon the young side shoots of the season. It enters at the axle of a bundle of leaves, and, cutting in a slanting direction right through the pith of the branch, passes out nearly an inch below the place where it entered. The shoot, of course, dies as far back as the part injured, and appears very unsighty until cut out, which is the only remedy I have yet found. In removing the injured shoot, I remove the insect along with it, by which means the plant is cleared of the evil.

Pinus Austriaca, or Black Pine.—This pine we consider the next in importance, not only as an ornamental object, but also as a valuable timber tree; and, as prices are at present, we should say of more importance to the planter than *Pinus*

ponderosa, on account of the ease with which it may be obtained, 1000 of the former fetching only the price of a good plant of the latter. In comparing this with the Scots fir, we found that, in all the different soils and situations upon which we have tried them—for we have planted them in light and stiff soils, and in situations sheltered and exposed—that the *Pinus Austriaca* takes the lead in every instance. The only objection to the more extended planting of this truly fine tree is the avidity with which it is devoured by game when first planted out. To prevent this, we plant in a protected nursery till they have obtained about 18 inches in height. If the situation in which they are to be put is stormy, we plant them smaller, as the hares, resorting to the shelter in winter, do not harbour in the exposed locality of the pines.

Pinus uncinata.—This pine we have planted in great numbers, some of which have now twelve years' growth upon them. None of them exceed 12 feet in height, while the average will not be above 8 feet. We do not at all regard them as timber trees; but, where planted singly, they are very ornamental. Having planted them upon both light and heavy soils, and in sheltered as well as exposed situations, we have been led to the conclusion that they require a considerable exposure. Those exposed to a good deal of storm are in reality greenest upon the stormy side, and are thriving well; while those planted in the low ground about the house, with the exception of some standing singly, are in a very sickly state, shewing all over yellow leaves, and the bark quite dry.

Pinus mughus.—This variety, of which we have tried several hundreds of plants, is very similar to the last in all respects, except that it is not so compact in habit, nor so quick in growth. We regard it as worthless, except as a botanical variety.

Pinus resinosa.—This pine has not succeeded here. Though planted seven years, it is not much larger than when first put out. The situation is also a favourable one for a delicate plant, and the soil is excellent. We have been a good deal disappointed with this pine, from the high recommendations it had from America.

Pinus Sabiniana.—Of this excellent and scarce fir we have several specimens; but, unfortunately, until very lately, we were unable to procure a seedling plant, and, therefore, this report of it must refer to grafted plants only. One of our plants, however, about two years since, having shewn signs of roots at the junction of the graft with the stock, I had the curiosity to try to bring the roots into the soil, by drawing a little leaf-mould and sand around it. I am happy to say I have been well rewarded; for the soil is now filled with roots, and the plant is thriving exceedingly. This pine approaches nearer to

the *Pinus ponderosa* in appearance than any other I know. It is perfectly hardy here, and is now making annually about 18 inches in length. I may here observe that we do not at all approve of grafted pines where seedlings can be obtained, not only from the fact that grafted plants are in many cases short-lived, (from the stock and graft not growing alike,) but also that only a branch is nursed instead of a proper stem.

Pinus Lambertiana.—Of this gigantic and lovely tree we can say very little at present, our first specimens being grafted, and not having made much progress. It is, however, perfectly hardy; and now that we are in possession of proper plants, we expect soon to be gratified with handsome and healthy specimens.

Pinus inops.—Of this also, although several plants were planted in 1836, we can say but little. From long confinement in pots, like some others, they did not set away quickly. They are now, however, making fine growths of from 15 to 18 inches. They are perfectly hardy, having withstood the severity of 1837–8 without any protection whatever. It may be necessary here to mention that we do not protect pines at all, except from game, by a basket around them, and that only some very rare sorts.

Pinus excelsa.—The first of our plants of this pine was raised from seeds here in 1835, and are now from 3 to 5½ feet in height It is perfectly hardy, and a very lovely plant. It seems to delight in free air and a good breeze. From all we have seen of this pine we think it likely to be a valuable tree in this climate and soil.

Pinus insignis.—Of all the most ornamental pines this is the most striking here. The foliage is of a beautiful delicate green, making sometimes two shoots in one season, yet never injured by frost. The annual growths average 3 feet; therefore, whether it may be a valuable timber tree or not, it is certainly an object of much interest as an ornament in the pleasure-ground. All our plants, though quite exposed in winter, have never been injured in any way.

Pinus Pyrenaica.—This is a very compact and desirable ornamental pine; rather slow in growth, however, and nothing remarkable with it why it should be desired as a timber tree in preference to those already in the country for a long time.

Pinus Banksiana.—This we think will not suit this climate either as a timber or an ornamental tree. With us it resembles a stunted shrub more than a hardy timber plant.

Pinus halepensis.—This pine is altogether worthless in this locality. It will not stand the frost. All our plants have been killed but one, and it is very sickly.

Pinus lilifolia.—This has also been destroyed by the winter, but we intend trying out another, with a little protection, till it gets farther from the ground with its top.

Pinus altissima.—In this pine I see no difference whatever form the common Scots fir, except that, as its name implies, it is the tallest, having overgrown all its neighbours, which were planted at the same time, by several feet, and in a very few years.

Pinus Laricio.—Of this we have a number planted in a plantation of oaks, larch, spruce, and Scots firs, and of all the evergreens the *Laricio* may be descried at a distance, by its towering over the rest. It does not, however, carry thickness along with its height, but resembles a plant drawn from want of space.

Pinus Cembra.—This well-known and admired pine thrives very well here. All our plants are exceedingly healthy. It is not, however, of very rapid growth. Though planted eleven years, there are none of our plants as many feet in height; but they are all very compact and beautiful.

Pinus Cembra Helvetica.—Of this we have only a single specimen. It does not grow faster than the last. It is more tufted in the foliage, and scarcely so robust in appearance. The annual growths for several years are about 9 inches.

Pinus Cembra Siberica.—Of all the *Cembreæ*, this, with us, is the most thriving, and we might also say the most desirable. No pine we know possesses more attractions, not only from the remarkable symmetry of all its proportions, but also from the beauty of its fine green leaves. The annual shoots are from 1 foot to 15 inches.

Pinus Australis.—This plant we have tried here, but it did not succeed. The severity of the winter destroyed the half-ripened wood. We fear it will not be found useful in this climate.

Pinus longifolia.—We have also tried this; but it was destroyed in the severe winter of 1837-8.

The following are lovely pines, but we have not had them for a sufficient time to test their suitableness for the soil and climate of this quarter—*Pinus Guardiana*, *Pinus Coulterii*, *Pinus patula*, *Pinus strobus*, *compressus*, *Tecotea*, *and Russelliana*.

Abies Menziesii.—This beautiful spruce, in one situation with us, is thriving well, making shoots of 2 and 3 feet a-year, while in another situation, within a very short distance, it is not doing well. In the first case the situation is shaded and more damp, while the other is duly exposed to the sun, and upon a very dry bottom. I have remarked that all plants belonging to the spruce and silver firs delight in deep, damp, and shaded situations, especially when young; and I conceive the reason to be this, that on light soils, with open exposure, the growth begins earlier, rendering it liable to injury from spring frosts.

Abies Douglasii.—This desirable tree was planted here in the spring of 1837, but perished the following winter. We did not, however, consider it a tender plant, but rather that it had not

got a proper hold of the ground in that very severe and trying season. We immediately supplied its place with others, which are doing well.

Picea Frazeria.—This fir, with us, is perfectly hardy. Its annual shoots average 15 inches. Whatever it may be as a timber tree, we do not regard it as more ornamental than the common silver fir. Our plants of these are all small. I can only state that they are perfectly hardy, having stood for three winters quite unprotected.

Auricaria imbricata.—This most magnificent of all the coniferous plants with which we are acquainted may be said to be fully more hardy in this quarter than the common furze—the latter having been hurt, and in many instances killed, when the former was altogether uninjured. Our largest is about 4 feet in height. We anticipate, however, now that it has fairly started, that the growth will be more rapid. Like the greater part of the coniferæ, the *Auricaria imbricata* delights in free air, with plenty of light. Those planted in shaded situations are making very little progress.

Cedrus Deodara.—This cedar is quite as hardy with us as the cedar of Lebanon. The growths, however, are nothing in comparison. The young shoots of many were injured for the first time by the late spring frost of the past year. We have planted a great number of this tree, and have no doubt whatever of its ultimate success.

To enter upon *Juniperus*, *Cupressus*, *Taxodium*, &c., belonging to this all-important order, would occupy too much space. Having a number of more recently introduced pines, &c., which we have had no opportunity of testing suitably, either as regards the soil or situation, we may refer to them at a future time.

ON THE IMPROVEMENT OF WASTE LAND.

By Mr James Cowie, Mains of Haulkerton, Kincardineshire.

[Premium—Silver Medal.]

Before the spirit of improvement in agriculture became so general, and when the value of arable land was comparatively small, it is not surprising that bogs or morasses were much prized, and carefully preserved from the effects of drainage, from consideration of the quantity of fuel which they afforded, and the value of the rough pasture which the driest portions yielded to

cattle when artificial grasses were unknown. It remained for the present age to turn such ground, which we term *waste*, to other and more profitable purposes.

The reporter entered on a new lease of the farm of Haulkerton Mains at Whitsunday 1843. The farm measures to about 240 acres of land, 44 of which were unarable, and consisted of bog or marshy ground. The whole of this extent used to be covered with water in rainy weather, and even in dry seasons almost the one half stood in water, and was so soft and spongy that a great part was quite impassable for man or beast. About thirty years ago, 18 acres of the driest of this bog were attempted to be cultivated; but after two crops were sown, and its scanty produce with difficulty reaped, the whole was abandoned to nature's care, up to the period of the last season. The value of the ground as pasture was under 10s. per acre, as the cattle could not reach a great part of it; and it was all so wet, that though there was apparently a good mouthful for them, they did not thrive on what they did eat. There was a good deal of rough grass cut off besides, which was used principally for litter. By these two modes of appropriation, the value of the subject might be brought up to 12s. or 15s. per acre.

Immediately after the farm was let, the proprietor, according to previous arrangement, deepened and straightened the stream running through the reporter's farm, known by the name of Luther Water, which opened up an outlet for ditches and drains that was previously awanting. As soon as this work was completed, the reporter commenced his operations of drainage and tillage, for which, be it remarked, he had no promise of any pecuniary assistance from the proprietor. The first necessary operation was the formation of main-drains or ditches at convenient distances for receiving the mouths of the small drains. Part of these were left open, and the rest filled either with tiles or stones. The tiles used cost 50s. per 1000, and the stones, which were from a red rock quarry on the farm, were built with an eye of 8 inches square.

The small drains, from first to last, were formed at 6 yards apart. Those on the first 10 or 12 acres were cut 28 to 30 inches deep, and filled with broken stones somewhat larger than road metal. The spade-work cost 3d. per rood of 6 yards, and the quarrying, breaking, and filling of the stones cost other 5d. There was often great difficulty in carting the stones to the drains, on account of the softness of the ground, and they had often to be thrown into a box made for the purpose, and carried by men. This operation, and the drudgery and danger which the horses were put to, compelled the reporter, after driving stones to a few more acres of the

firmest of the ground, to fill the drains with tiles, which were conveyed with less trouble and risk. These drains were cut 22 inches deep, at 1½d. per rood of 6 yards, and the wooden soles and the tiles cost 4½d: 15,000 tiles were in this way put in; but as the difficulty of cartage, from the cause above noticed, was great, and the season far advanced, the reporter had latterly recourse to turf drains. These were cut 28 inches deep and 16 inches wide, and in order to form a *shoulder* for the turf to rest on, the lowest 7 inches were cut only 7 inches wide, in the form of a groove. The turf was carefully cut from the top of the drain, if suitable, or as adjacent as it could be got, and put in with the grass side under; and when the shoulder was tender, fresh tough pieces were inserted. The cutting of these drains cost 2½d. per rood, and nearly another ½d. for putting in the turf.

With the exception of a few acres, the soil, to the depth of 10 inches, is a rich alluvium, having been deposited at no very remote period by frequent overflowings of the Luther, which passes through a rich district, and carries off, when flooded, more or less of the loose soil, leaving it in favourable situations, such as the one we have been treating on, or carries it to a less grateful resting-place—the sea. The subsoil is mostly of black earth, of a firm texture, and is undoubtedly a deposit immediately antecedent to the red soil on the surface, and could, no doubt, be brought into profitable tillage.

After the drains had been allowed to run off the moisture for a few weeks, and being favoured with a dry season, the whole, with the exception of about half an acre, which was tilled with the spade, was ploughed, although sometimes with great difficulty, as the horses were in many places continually sinking, and had sometimes to be released by means of ropes. There were three horses yoked abreast in the plough, and the furrow taken averaged 8 inches in depth, being as much as the horses could draw. The ploughing was finished by the middle of March, and the ground was sown by the end of the first week of April. The quantity of oats sown per Scotch acre was a quarter, and the seed was harrowed in *along* the furrow, and not *across*, which would have raised the furrows, and required three double tines. The corn was not very well covered, especially on the softest ground, where the horses still sank; but what was wanting in the thickness of the briard was afterwards made up by stocking or tillering, so that the crop was thick enough, and too thick in some places. The crop on the greater part was very fine, but part of it carried such a flush of straw, that the winds and rain laid it, and prevented the corn from ripening so well. The crop was cut principally by the sickle, and was stacked in excellent order in the first week of October. The produce cannot be very precisely

ascertained as yet, but it will not be under 5 quarters per acre. The quality of the grain is not good. The corn is dark in colour, but weighs 40 lbs. per bushel. The reporter intends to take a few crops of oats until the water-grasses are expelled, and the soil brought into proper mould for a green crop. The ground is now quite dry and firm, and the reporter is sanguine that the great labour and outlay of capital which he has bestowed on such a large and valuable track of land, will be amply repaid by its subsequent cultivation; and he has in the meantime earned the thanks and congratulations of his friends and neighbours, for having, as they are pleased to express themselves, so promptly undertaken and effectually completed such a task; the existence of so much waste marshy ground having long been regarded as a dishonour to the agricultural spirit of the district, and highly injurious to the climate, from the frosts and miasms which it encouraged, affecting as they did both the quality of the crops and health of the inhabitants.

The reporter may be permitted to add, that, in addition to the improvements above detailed, he has thorough-drained, uniformly at 6 yards apart, 60 acres of old land, principally with stones, and the rest with tiles, besides erecting a water-power for a thrashing-mill at a considerable cost, and performing other works, solely at his own expense, but for which he hopes yet to be compensated by the fruits "of two blades where only one grew before."

It should have been remarked that open ditches are found to answer better than close drains for main-drains; as, from the quantity of iron-ore and liquid silt which run out of newly taken in ground, the tiles or eye formed by the stones are apt to fill up.

REPORT OF EXPERIMENTS IN DEEP PLOUGHING.

By Mr James M'Lean, Braidwood, Penicuik.

[Premium—Five Sovereigns.]

Since the introduction of furrow-draining, subsoil-ploughing is altogether a new feature in Scottish husbandry, and, like every other agricultural novelty, its utility has become matter of dispute, and many obstacles have been thrown in the way of its progress. There can be no doubt that subsoil-ploughing will not operate alike on all soils—indeed, on many old cultivated lands of a gravelly texture it may, in the first place, prove injurious, from its permitting the rich ingredients of the putrescent manure to be washed down before the plants receive its benefit, while old cultivated clay-land, resting upon a loamy or

even sandy subsoil will, in most instances, be greatly benefited by the operation.

To all soils having originally a redundance of moisture, but completely discharged by furrow-draining, it may be safely affirmed that subsoil-ploughing will prove of essential benefit, whether they may have become exhausted from long cultivation or newly reclaimed from a state of nature.

The experiments detailed in this paper will, I trust, afford satisfactory illustration of this assertion. It may be unnecessary to inquire into its cause, the effect being more important; we may state, however, that after furrow-draining old cultivated soils, subsoil-ploughing becomes imperative, more especially if the soil and subsoil be retentive—such soils become hard and crusty, from the water not escaping freely into the drains, and leaving it in a state not well adapted for vegetation. Subsoil-ploughing completely breaks through this hard pan or crust at the bottom of the old furrow, occasioned by the former passage of the plough, and converts it into mould, which affords a free discharge of the superabundant moisture into the furrow-drains.

The soil of this farm rests on the compact trap-rock of the Pentland range, and is, no doubt, derived from the desintegration of the felspar; and the small fragments of stone constituting part of the soil, and profusely interspersed throughout the whole, consists of compact felspar clay-stone and felspar porphyry. The soil has been analyzed and found to contain, in addition to alumina, silica, and a small quantity of oxide of iron, carbonate of lime, to the extent of about 5 per cent., and sulphate of lime. The subsoil is similar to the soil, only, being washed down by the continual rains and springs which issue out of the Pentlands, has become so hard and impervious to the plough as to resemble a retentive clay.

The field experimented upon has been under cultivation for a number of years, and, except in the most favourable seasons, yielded but deficient crops. In 1842 it was under oats, and that portion which was experimented upon proved a very scanty crop.

In the winter of that year, it was furrow-drained with tiles at the distance of 15 feet apart, and with three ploughings, harrowings, and grubbing, it was reduced to a proper state for being planted with potatoes, in the beginning of May, with the same seed, and under the same treatment in planting and manuring as the rest of the field. The plants came up sickly and were far behind the adjoining ones, so much so, that I do not think one-fifth of the seed ever vegetated at all. At one time I resolved to plough up the crop and sow turnips, but let them remain. I lifted the crop on the 29th day of August, with the intention of having the ground subsoil-ploughed; and the pro-

duce only averaged 4 bolls of 4 cwt. each per imperial acre. Having had an opportunity of seeing Mr Smith of Deanston's subsoil-plough at work, and observed it, from its great weight, very unwieldy to manage, I converted one of my strongest iron ploughs into a subsoil one, by taking off the mould-board and attaching a narrow piece of iron about four inches broad to the share, which caused it to go steadily, and prevented the breast-work from wearing. I put the Hunterian swing-plough first, taking a depth of 8 inches, followed by the subsoil one, with two horses, taking an additional depth of 7 inches, making a total depth of 15 inches. It was incredible to see the fine mould (or rather compound) which was loosened by the subsoil-plough, the land having been reclaimed from a state of nature upwards of forty years ago. It was at that time well limed, and had received several limings, both in a powdery and compounded state, since that time. After being subsoiled, it was well harrowed, and received another furrow when ploughing it in ridges for the succeeding crop. It remained so all winter, and was sown with common barley on the 1st of April. The weather being favourable, the field was finished very smoothly. The whole field was rolled before the barley appeared ; both the subsoiled and unsubsoiled portions had the same appearance at brairding, and continued much alike as long as the drought lasted, which, no doubt, prevented the fibres of the grain from deriving that benefit from the subsoiling they would otherwise have obtained, but whenever the field received a drenching of rain, the subsoiled part shewed a decided superiority, and continued to make rapid progress before the other part of the field up to the time of harvest. The entire field was cut upon the 3d day of September. The subsoiled portion was scarcely so ripe as the other, from its being considerably lodged ; but I was induced to cut it from the favourable state of the weather. The crop was allowed to remain in the stook until the 15th day of September, when it was weighed and thrashed.

Table shewing the Comparative Results upon Land Subsoiled and not Subsoiled, bearing a Crop of Barley in 1844.

No.	Treatment Received.	Produce of Grain per Imperial Acre.			Produce of Straw per Imperial Acre.		Weight per Bushel.	Excess Produce of Grain.		Excess Produce of Straw.		Quantity of Ground.
		qrs.	bu.	pks	st.	lbs.	lbs.	bu.	pks.	st.	lbs.	
1.	Subsoiled,	7	3	0	206	6	$52\frac{1}{2}$	7	3	38	0	2 Acres.
2.	Not Subsoiled,	6	3	1	168	6	$52\frac{1}{2}$	...		...		2 Acres.

Another part of a field, which I intended to furrow-drain and summer fallow in 1843, consisting of about four acres, after repeated ploughings and harrowings, I subsoiled to the depth

of 15 inches, and afterwards limed it with 30 bolls of lime-shells per acre. It was applied in a hot or floury state immediately before ploughing the seed-furrow. The land upon each side was properly prepared for turnip, and manured with winter-made dung. The crop throughout the season gave convincing proofs of the advantage of subsoil-ploughing.

Not having ascertained by separate weighing the comparative results of this portion of subsoil-ploughed ground, I may state that the apparent difference was equal to, if not greater than, the one accurately tested by weighing, measuring, &c.

Another field, containing about four acres, was drained in winter 1842, and sown with oats in spring, and produced rather an inferior crop. It was subsoiled immediately after the crop was secured, and, being more tenacious, both ploughings only afforded a depth of 13 inches. Ever since its improvement, which at that time produced a scanty herbage, when the adjoining lands were under green crop, it was set apart for summer fallowing, no doubt, from its great tenacity, and being always in a soft and marshy state: it was completely dried by the furrow-draining; and in spring, when it was wont to be the last field upon the farm in a fit state for ploughing or sowing, in spring 1843 it assumed a different aspect, and was the first to give signs of approaching seed time. I was sanguine that the furrow-draining would have effected all that was necessary; but, ever since the turnips brairded, I found my expectations disappointed, the furrow-drained part looking thin and stunted. At one time I expected to have to sow them a second time, or to summer fallow the ground. From the genial nature of the season, however, they assumed a healthy appearance, and have ultimately proved nearly an average crop; but those upon the subsoiled part came off at first with a rapid growth, and, during the season, gave ample testimony of the benefit derived from subsoil-ploughing.

Table shewing the Comparative Results upon Land Subsoiled and not Subsoiled, growing Turnips in 1844.

No.	Treatment Received.	Produce per Imperial Acre.	Excess Produce per Imperial Acre.	Quantity of Ground.
		tons. cwts.	tons cwts.	
1.	Subsoiled, . . .	23 17	4 12	2 Acres.
2.	Not Subsoiled, . .	19 5	...	2 Acres.

I lately examined a field of about eight acres, which for many years had been conspicuous for bearing inferior crops, whether grain, green crops, or pasture. It was furrow-drained in the winter of 1842 and subsoiled in autumn 1843, after the separation of the crop, with the Deanston subsoil-plough, drawn by

four horses, the common plough going before, making a total depth of 15 inches. It was sown with Swedish, yellow, and common turnips in 1844. It was well prepared, and received a liberal supply of putrescent manure and compost of lime and earth. The crop has proved most luxuriant, so much so, that I have not seen a better one this season. Thus furrow-draining and subsoiling constitute a simple mode of changing unproductive land into one of productiveness and fertility.

I have thus given a short detail of the state of the land previous to being furrow-drained and subsoil-ploughed, and the results, compared with land not subsoiled, upon turnips and barley in 1844, have proved quite satisfactory even where great expense has been incurred in furrow-draining, liming, and manuring. An additional outlay of—say 12s. per acre—is, however, injudiciously withheld for perfecting an improvement which will render the land capable of bearing abundant crops.

PROCEEDINGS OF THE AGRICULTURAL CHEMISTRY ASSOCIATION OF SCOTLAND.—1845.

INTRODUCTION.

It has occurred to the committee of management of the Agricultural Chemistry Association that a brief sketch of the history of the association, with a list of its regulations, would be a fitting introduction to the reports on different subjects of interest now about to be published, which have been prepared by their chemist, Professor Johnston. As yet the origin and progress of the association have had no more enduring record than the pages of a newspaper, while something more permanent would seem to be called for, were it only to satisfy the wishes of members to possess it, or to gratify the curiosity of others, some of whom may think of getting up some such scheme in other lands.

The Agricultural Chemistry Association originated with some farmers in Mid-Lothian. It was in the summer of 1842, shortly before the cattle show was held that year in Bruntsfield Links. The first mover in it was Mr Finnie of Swanstone, who soon found zealous coadjutors in some of his friends—intelligent and industrious tenants, who, in the course of their own prosperous experience, had too often profited by science, to be blind to the advantage of any general scheme that would bring it within the reach of all, particularly in a season of depression and difficulty such as then prevailed. The design was practical in its object as in its origin. What they aimed at in their first sketch was

merely to have a chemist for the Highland and Agricultural Society, who, on very reasonable terms, should analyze soils and manures, and probably give lectures. But the terms they proposed for the analyses, ranging between 1s. and 7s. 6d., were too low, unless a fair salary could be added; and the Highland and Agricultural Society was already engrossed with equally important objects, and had not leisure and funds for the project. Although they declined, however, to undertake the care and superintendence of it, they gave it every encouragement, and, in particular, they commended it to the public very effectually, by passing a unanimous resolution of their directors, "That its object was highly deserving the approbation of their society, and had their best wishes."

This was on the 25th July 1842; and, stimulated to fresh exertions, within a week, Mr Finnie and his friends, amongst whom the late Mr Oliver of Lochend deserves especial notice, were able to report to a meeting held in the show-yard that they now had the support of thirty landed proprietors and of sixty-seven farmers. At length, on the 12th December, another meeting took place in Douglas' Hotel, at which many of the more influential of our proprietors now attended, and Lord Melville took the chair. It was there resolved formally to constitute the association—such were its prospects of success—and to meet again on an early day in January, by which time it was hoped that L.500 a-year would be got subscribed, through the exertions of an interim committee, with Mr Milne at its head, who had all along given the most zealous service. A smaller sum than L.500 seemed not likely to secure a chemist of eminence, with the low charges for analyses which, from the first, had been the main motive and inducement to the scheme.

It would be tedious to follow in detail more of the association's history. It was an effort made by the tenantry to improve their own condition, and it required and received the co-operation of the landlords.

The time came, at length, when a chemist was to be chosen; for the subscriptions—many of them promised for five years—warranted this, and the Highland and Agricultural Society had engaged for L.50 yearly. The choosing of the chemist led again to the preparation of regulations, to define his duties and the members' rights; and, at last, in July 1843, Professor Johnston of Durham was elected, although it was not until the Martinmas following that he entered on his charge.

In looking over the regulations, which are appended, it will occur to the reader that the views of the association have expanded, and slightly varied from the first design. Not only are the objects more distinctly classified now, as the *diffusion* of exist-

ing knowledge on the one hand, and the *extension* of it on the other, but the charges for analyses, though still very low, are above the rates first thought of. All this, however, was unavoidable. The diffusion of knowledge, although not so pointedly noticed, was still part of the original design; at least lectures to agricultural societies were so, though the same cannot be said of giving instruction in schools, with which, however, the association has not embarrassed itself. Again, as to the extension of our knowledge, it was always a leading object, if not *the* leading object, with those who chalked out the scheme; only it may be possible that, instead of analyses for immediate profit, it has a wider range now, and looks to establish general principles no less. And what would it avail to know that a certain soil contained all the elements of a particular crop, unless it was also known that the soil had them in those states of combination in which alone the crop would receive them? And then the use of different substances comes in, which, though not entering the plants, yet dispose the soil to yield the combinations wanted. Lastly, however, and as regards the rates of analyses, all that shall be said of them here is, that raised, no doubt, although they have been above the charges originally contemplated, they are still about one-third of what they actually cost the chemist himself, and are, therefore, a source of loss instead of profit to him. It is to be hoped, however, that the subscriptions will be so ample that his income, with all its abatements, may be from L.400 to L.500 a-year.

Since Professor Johnston entered on his duties, at Martinmas 1843, there have been three half-yearly reports made to the members of the association. The first was on 8th January 1844, too soon after the beginning of his labours to afford much to report on beyond the promising condition of the subscriptions, and the commencement, in good earnest, of the work of analysis. It was stated that already letters of advice had been pouring in, and many investigations entered on, and that even distant proprietors, of whom the Duke of Northumberland was pre-eminent, were becoming interested, and sending in their subscriptions.

The next report was made on the 1st July 1844. It confirmed all the good promises of the preceding, and announced more subscriptions and more work done. But what was most pleasing in it was the proof it afforded that farmers had already begun to feel the benefit. One, who had been in the habit, as he stated, of expending yearly about £150 on foreign manures, wrote thus:—

"Previous to the existence of the association, I was obliged to make my purchases with no other means of judging of their probable genuineness or fertilizing properties than by what their appearance indicated; but this last season I have invariably

made my selection after obtaining a minute analysis of the different samples, and choosing the one most favourably reported on by the chemist, and, upon delivery of the stock, had a second analysis performed, in order to satisfy me that it was not inferior to the samples from which I bought. I have no hesitation, therefore, in concluding that, by such means, I have been enabled to spend my money with a degree of certainty and satisfaction which amply repaid me for the trifling expenses I incurred. In illustration, I may mention that part of a cargo from which I obtained my supply was found inferior to the rest by 10 per cent., but I, of course, was enabled, by the plan adopted, to demand compensation, which was immediately conceded.

"With regard likewise to the fattening of my live stock. Having obtained from merchants samples of such foreign cake as they had, I submitted them for analysis to Professor Johnston, and from amongst them was enabled to select one which was offered to me as a manure, which I purchased at 85s. per ton. Having confidence in what it was composed of, I gave a regular supply to a breeding stock of black-faced ewes at a very small cost indeed, and I am not exaggerating my probable gain by that discovery at from L.50 to L.60. The ewes, though feeding on stinted hilly pasture, were in a condition, at lambing time, never witnessed in former seasons."

A proprietor in the west of Scotland, having sent some samples of soils from his estate for examination, wrote as follows to Professor Johnston, after receiving the analysis:—"From your analysis of my soils, it appears that they are deficient in magnesia and the phosphates, which accounts fully for the very beneficial effects of both these substances when applied to my soils as a manure. It is a striking instance of the good that may be obtained from accurate analysis, shewing that time may be saved by minute attention to its indications, and that the total failure of a crop may be prevented."

Various other testimonies were afforded to the association's usefulness. In particular, an anxious desire had sprung up all over the country to hear Professor Johnston lecture; and this he had met, as he best could, at that season of the year, and with his other duties in the laboratory to attend to, by travelling from one place to another, wherever farmers came to meet him. Not fewer than twenty-six lectures had been given in this way, with many an opportunity, at private houses and in the fields, for discussing all that was newest or most interesting in them. This idea has been followed up by having public breakfasts, with conversations on topics of interest, whenever an occasion offers. The lectures for the season, and before Professor Johnston took his departure for England, as he had stipulated for, were wound

up by an address he delivered in Edinburgh on 24th April. Lord Dunfermline, who presided on that occasion, expressed an anticipation in which all present joined—"That the more the practical objects of the association were explained and understood, the more would its members be increased and its influence extended." The lecture itself was much calculated to support this confidence; but it would be out of place here to do more than glance at the numerous topics it embraced:—The apprehension of over-liming in one case removed, and the evil traced to another source—the discovery of turnips injured by the presence of manganese in the soil—the varying composition of different marls—the value of burnt peat as contrasted with Dutch ashes—the varieties of guano—their influence in lessening the sugar, oil, and pectic acid in turnips when used instead of common farm-yard manure—and much more besides.

The last report which the committee have had the honour of submitting was on the 13th of January. By this time the lectures had amounted to 53 and the analyses to 384. After specifying the various matters analyzed, and noticing how efficient a check it had proved on adulteration, the report proceeded thus:—

"But the most important, and by much the most interesting, results of the analytical inquiries remain to be mentioned. Without entering on the details, which could not be given here, the following statement must suffice:—

"1. It will be remembered that, last year, the analysis of two samples of turnips, raised respectively by means of dung and guano, presented remarkable difference in their chemical constitution. In consequence of this, experiments upon their feeding properties have been made, under the direction of Lord Blantyre, and the result has been, that the cattle fed on the dung turnips increased much more rapidly than when fed on the other. So important a result, in reference to the value of guano, requires that the experiment should be repeated, which is about to be done in several parts of the country.

"2. Oats have been found, on special investigation into those ingredients in them which yield muscle in animals, to possess those principles in larger proportion than any other variety of our grains usually employed for food, which will account for their very general and profitable use among our hardy peasantry.

"3. The quantity of those ingredients in different varieties of turnips has never been investigated hitherto. It is now, however, under examination, and already it has been ascertained that, in this respect, they are equal to from 1-10th to 1-40th part of their weight of ordinary wheat or barley.

"4. By analysing a variety of trap-rocks, from different coun-

ties of Scotland, the proportion of lime they contain has been found to be very much greater than was generally supposed, amounting, in some cases, to as much as 1-5th of what is contained in ordinary limetones. This fact has important bearings on the application of lime in districts where these trap-rocks abound, and the soil is formed from them. It also explains the source of the lime in marl-beds, in hollows, with no calcareous rocks near them, as in that recently opened beside Holyrood.

"5. In connexion with this subject, it has been considered of consequence to ascertain the proportion of lime present in other kinds of rocks, and particularly in the clay rocks of Wigtonshire and the neighbouring counties, where improvement is making great progress. Among other results already obtained, it has been found that those rocks from which, in a great measure, the soils there are derived, contain only about one per cent. of lime; and hence the beneficial effects which follow the use of lime there, and even the necessity for its application. This fact is the more important, as the clay-slates form a sixth part of the entire surface of Scotland, the trap-rocks less than a tenth part.

"6. Barley sprouts, and the first dregs from distilleries, contain so much of the valuable phosphates, that they admit of being most beneficially applied, and the importance of preserving them in all cases can be justified on the soundest principles.

"7. The ingredients of the refuse lime of gas-works have been found to vary so much as to require great caution in the use of it. Farther, what has been held out to the farmers, in England more especially, of its containing much nitrogen, and on this account being a very valuable manure, is not to be depended on.

"8. Practical farmers in dairy districts, having remarked that certain varieties of salt most favoured the storing of their cheese, this subject has been inquired into, and those varieties which contain most of the deliquescent chlorides have been found to be those which, in practice, answered best. This is rather remarkable.

"9. It will be recollected that, at the last half-yearly meeting, the attention of the chemist was particularly drawn to the prevailing disease in the potato, with the view, if possible, of throwing some light upon its cause and cure. With this view, soils and potatoes have been analyzed; and, for the purpose of collecting information, it was made the subject of discussion at one of the public breakfasts in Glasgow. Materials are thus gradually accumulating, out of which it is to be hoped that something practically useful may at length be extracted.

"10. While we select these from among the more easily understood practical results which have been obtained in the laboratory, we ought to mention that numerous investigations of a

higher kind have been constantly in progress, by which those scientific principles are to be explained and illustrated, upon which a strictly scientific agriculture is hereafter to be based."

To guide the future course of inquiry, some subjects have been suggested to Professor Johnston as deserving his first attention, such as the refuse matters of different manufactories that might be turned to account, a substitute for foreign oil-cake, and certain others. In time, it is to be hoped, the results will appear in the following reports, for the means of disseminating which, among their members at this early period, the Agricultural Chemistry Association owes very much to the liberality of the Highland and Agricultural Society.

For the convenience of members, we subjoin the following statement of the chief objects of the association, the rules for its management, the duties of the chemist, and the privileges of subscribers :—

I. OBJECTS OF THE ASSOCIATION.

The great design of the Association being the improvement of Agriculture by the application of Chemistry, Vegetable Physiology, and Geology, it contemplates as its leading objects—

1. The diffusion of existing information, theoretical and practical, by means of occasional verbal expositions, addresses, and correspondence ; and,

2. The enlargement of our present knowledge, by experimental investigations of practical Agriculturists in the field, and of the Chemist in the laboratory.

In regard to the *diffusion* of such knowledge as already exists, it is plain that there can be no precise regulations, but that much must be left to the discretion of the Committee, who, according to the exigencies of particular districts, the opportunity of finding farmers at annual shows or exhibitions, and the leisure of the Chemist from his proper chemical duties, will prescribe the time and manner of his instructions.

The *enlargement* of our present knowledge, by experiments in the field and laboratory, is what must be regarded as the more important purpose, and it is that which will chiefly engage the Chemist.

II. RULES OF MANAGEMENT.

1. The appointment of the Chemist will, subject to the approval of a General Meeting of Subscribers, be vested in a Committee of Management, to be designed the "Committee of the Agricultural Chemistry Association"—who also shall have the power of making arrangements for the duties of the Chemist, and shall have the management of everything connected with the Association.

2. There will be two Annual General Meetings of the Subscribers, the one on the day following the General Meeting of the Highland and Agricultural Society in January, and the other on the day following the General Meeting of that Society in July;—at which two Meetings there will be a Report by the Committee of what has been done during the previous six months, in carrying out the objects of the Association.

3. The General Meeting of the Subscribers will be held in the upper large Hall of the Highland and Agricultural Society's new Museum, and all Meetings of Committee will be in the Library of said Museum—the use of which rooms, with lights and firing when required, has been handsomely given by the said Society, for these purposes respectively.

4. In return for this accommodation to the Subscribers, and also for an annual grant of £50 from the funds of the Highland and Agricultural Society, the said Society will be entitled to elect three Subscribers, to be Members of the Committee of Management.

5. The Subscribers will be entitled to elect from their own body, six members of Committee; the vacancies among whom may be filled up, at any General Meeting of Subscribers.

6. At the General Meeting of the Association in January, two of the said six Members of Committee will go out, as may be arranged among themselves, or by rotation, and successors to them will be appointed by the Subscribers at said General Meeting; and of the said three Members appointed by the Highland and Agricultural Society, one will go out at the same period, and his place be supplied by another Subscriber to be elected by the Society at their Annual Meeting in January.

7. In addition to the said nine Members of Committee, the Subscribers in each County in Scotland, contributing £20 annually to the funds of the Association, will be entitled to elect annually one of their number to represent them in the Committee, and who shall be held to be a Member of Committee.

8. The Meetings of Committee will be open to all Subscribers, but they will have no vote at these Meetings.

9. The Committee of Management will have a right to appoint a Secretary, and also, if necessary, a Clerk and Treasurer.

10. Local Secretaries, to aid generally, and to facilitate the communication of Members at a distance with the Chemist, will be appointed at the suggestion of Farmers' Clubs or of Members.

III. DUTIES OF THE CHEMIST.

1. The Chemist will be expected to assist in suggesting such series of experiments as are most likely to promote the objects of the Association—to consider and explain theoretically the

results obtained—and to point out how they may best be turned to account by the practical farmer.

2. Chemical analyses being of the highest importance, both as connected with such experimental inquiries, and to inform private parties of the value of different substances, whether for sale or use, the Chemist will be expected to analyze soils, manures, limestones, the products of vegetation, and other such substances—the cost of their transmission to him being defrayed by the persons sending them.

3. It will be his duty to give advice, whenever it is in his power, regarding the mode of culture followed in any particular district, with a view either to its improvement or its adoption elsewhere; and, upon the weekly market-day in Edinburgh, to devote a certain portion of time to giving practical directions to Members of the Association wishing the benefit of his counsel.

4. Before commencing the analysis of any substance submitted to him, the Chemist must be furnished with a statement of the precise object which is proposed to be attained by it.*

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* Parties who send soils for analysis are requested to be as explicit as possible in regard to the object they have in view in wishing the analysis made. The kind of cropping and liming to which it has been subjected, the state of the drainage, both natural and artificial, and the kind and quantity of manure usually employed, are all important points in connexion with the advice which, after the analysis is made, the chemist may think it proper to give. The letter accompanying the soils should, therefore, advert briefly to these several topics.

To enable a party sending a soil for analysis to put the proper questions to the Chemist, it may be mentioned here that a fertile soil contains, besides animal and vegetable substances, called *organic matter* by chemists, a sensible quantity of not less than ten different substances. Thus, in three soils of unlike fertility, from different districts, there were found in 1000 parts—

	Fertile without Manure.	Fertile with Manure.	Barren.
Organic matter,	97	50	40
Silica, (in the sand and clay,)	648	833	778
Alumina, (in the clay,)	57	51	91
Lime,	59	18	4
Magnesia,	8½	8	1
Oxide of Iron,	61	30	81
Oxide of Manganese,	1	3	½
Potash,	2	trace.	trace.
Soda, } chiefly as common salt,	4	...	...
Chlorine, } chiefly as common salt,	2		
Sulphuric Acid,	2	¾	...
Phosphoric Acid,	4½	1¾	...
Carbonic Acid, (combined with the Lime and Magnesia,	40	4½	...
Loss,	14	...	4½
	1000	1000	1000

In *most cases*, however, a knowledge of the relative proportions of sand, (siliceous matter,) clay, lime, organic matter, and oxide of iron, will be sufficient to indicate

5. He shall be bound to give only such an analysis as is adapted to the particular practical object for which it is required.

6. The Chemist will have his Laboratory in Edinburgh, but during a portion of the year he will visit different parts of Scotland, on invitations, and at times approved of by the Committee.

7. When the services of the Chemist are so required, his expenses while travelling to and from, and residing in, the district, are to be defrayed by the parties inviting him.

8. The Chemist, if authorized by the Committee to visit the lands of any Members of the Association, will be expected to do so on the same terms.

9. A short journal must be kept by the Chemist of his proceedings, whether in Edinburgh, or in the country—a record kept of all the analyses he makes, and of any reports he may draw up—all of which, as well as the correspondence on the business of the Association, must be patent to the Committee of Management.

10. The Chemist must, at his own expense, provide a Laboratory, with the necessary apparatus and materials, and such assistants as he may require, for enabling him to perform the business of the Association.

11. The Chemist will be expected to give gratuitously his advice to the Committee of Management, on all matters connected with the objects of the Association.

12. All applications for analysis or advice are to be addressed to the Chemist, who, if he finds it necessary, may consult the Committee.

13. The foregoing duties are to be performed on the following terms.

SCALE OF CHARGES.

1. Testing saline manures, (such as Gypsum, Nitrate of Soda, Sulphate of Soda, Guano, Bone-dust, Rape-dust, &c.,) for *adulterations*, for each sample, 3s.

2. Examining limestones, marls, shell-sands, &c., to ascertain the *proportion* of lime, and the presence of Magnesia and Alumina, 5s.

3. Ascertaining the *proportion* also of the latter, or of any other ingredients, for each ingredient 2s. 6d. extra.

4. Examining a soil, or the ashes of a plant, to determine the *proportion* of one ingredient, 5s. The proportion of every other ingredient to be charged 2s. 6d. additional for each.

5. Examining, with a view to its commercial and agricultural value, any artificial mixed manure, (such as manufactured Guano, Humus, Animalized Carbon, patent manures, &c.,) 5s.

6. Examining the products of vegetation, to determine, for example, the quantity of water, or of starch, or of sugar, in potatoes or turnips; or of oil or gluten in wheaten flour from 2s. 6d. to 5s.

7. Letters asking advice, unless accompanying, and in reference exclusively to, substances transmitted along with them for analysis, to enclose 2s. 6d.

8. No sample to be sent for analysis without the fee being enclosed with it.

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the kind of *practical* treatment to which the land ought to be subjected, in order to render it more productive.—See *Johnston's Elements of Agricultural Chemistry and Geology.* 4th edition, page 100.

IV. PRIVILEGES OF SUBSCRIBERS.

1. Every landed Proprietor who pays L.1 yearly, and every tenant farming other persons' land, who pays 10s. yearly, will, on subscribing their names, or authorizing their names to be inscribed in a book to be kept for that purpose, be entitled to the services of the Chemist on the terms mentioned in these regulations.

2. Every ten shillings subscribed by a tenant, or twenty shillings by a proprietor, will entitle to two analyses yearly on the above terms, and all beyond that number to be charged one-half more. To the numbers of letters of advice, it appears unnecessary at first to prescribe any limits or check beyond the small charge above stated.

3. The Directors of the Highland and Agricultural Society will be entitled to publish exclusively, in their Transactions, the Reports made to the General Meetings of the Subscribers, as well as such chemical analyses as in the opinion of the Committee are deserving of publication, with permission, however, to the Agricultural Chemistry Association to send the former to the newspapers, and to throw off copies of the latter for such of their own members as do not get the Transactions.

4. Every Agricultural Society, by paying to the funds of the Association L.5 yearly, will be entitled to one lecture from the Chemist; by paying L.10, two lectures; and by paying L.15, three lectures;—and such Society will have right to prescribe the particular subject of each lecture, as well as to have these lectures delivered either separately or together.

A. COVENTRY, *Hon. Sec.*

I.—EFFECT OF DIFFERENT MANURES ON THE COMPOSITION OF THE SWEDISH TURNIP.

It is a fact, in regard to which little doubt can now be entertained, that the chemical composition of a crop depends, among other causes, in a considerable degree upon the kind of soil on which it is grown and the kind of manure by which its growth has been promoted. Many experiments in the field, however, and many careful analyses in the laboratory are required before we can exactly understand and appreciate the kind and extent of this influence which soil and manure respectively exercise. It is of much consequence to practical agriculture that such experiments and analyses should be extensively made and recorded.

Early in the past year, (1844,) two samples of Swedish turnips, grown by the aid respectively of farm-yard dung and of guano, were transmitted to me from Lennox-love for analysis, at the request of Lord Blantyre, with the view chiefly of ascertaining

how far the proportions of sugar and other organic ingredients differed in the two. The inquiry being one of general and scientific interest, as well as of immediate importance in regard to the value of this protracted crop, I caused my assistant, Mr Fromberg, to submit the turnips to a more detailed examination than would otherwise have been considered necessary. The two turnips examined were large, and nearly of equal size, but whether they were of equal degrees of ripeness or maturity I had no means of ascertaining. They were grown upon the same soil, and differed only in the one being manured wholly with farmyard dung, the other wholly with guano.

(1.)—Of the Organic Part.

1°. *Per-centage of water.*—In both turnips the quantity of water present was very nearly the same—the loss of the dung turnips by drying being 88, and of the guano turnips 87.9 per cent. In both, therefore, every ten tons contained about one ton of dry food; and this is very nearly the average quantity present in most of our solid yellow turnips.

2°. *Quantity of oil or fat.*—The quantity of fatty matter contained in turnips and other similar roots is known to be comparatively small. By some writers, as by Boussingault, it is said to be so small as to contribute scarcely in any degree to the increase of fat upon animals which are fed with them. And as every skilful and economical fattener of stock gives chopped straw, hay, bran, or some other dry food along with turnips, potatoes, or mangel-würzel—which straw and hay contain often a very considerable per-centage of oily matter—these writers ascribe the origin of the fat acquired by the animals to this dry food they have consumed along with the turnips. The publication of such opinions is valuable, where it leads to experiments for the purpose of clearly making out what the truth really is; for on whichever side the truth may be found to lie, it must obviously be of much economical value to the practical man that it should be ascertained.

The two turnips under examination gave *per cent.* of oil in their recent and in their dry states respectively—

Dung Turnips.		Guano Turnips.	
Undried.	Dried.	Undried.	Dried.
0.25	2.09	0.16	1.26

That is to say, every 100 lbs. of the fresh dung turnips contained 4 ounces, and of the guano turnips 2⅔ ounces of fat. The former, therefore, are capable of supplying much more fat to the animal fed upon them than the latter. And if the quantity of fat contained in the increase of an animal during fattening be taken at one-sixth of the whole live weight, then 100 lbs. of the dung turnips would supply fat enough to lay on

$1\frac{1}{2}$ lbs. of live weight, while the same weight of the guano turnips would add to the living weight only 1 lb.—or one-third less.

The practical man will understand the value of this difference in the constitution of the two turnips, if he recollects that a heavy ox put up to fatten will consume nearly 200 lbs. (14 stones) of turnips in a day, and, consequently, may obtain from the one variety as much oily matter as will lay on 8 ounces of fat—sufficient for 3 lbs. of live weight per day—while from his daily ration of the other he will obtain only $5\frac{1}{3}$ ounces, which will lay on only 2 lbs. of live weight.

These differences not only throw light upon the relative values of the two turnips under consideration, but shew also one source of the discrepancies which exist among the various results which have from time to time been published in regard to the quantity of turnips consumed by cattle of different kinds and ages, and the very different proportions of beef or mutton into which they can be converted.* It is of comparatively little use indeed to make experiments upon the feeding properties of turnips, unless the different samples employed be previously subjected to a rigorous chemical analysis.

I have already alluded to the opinions of Boussingault and Dumas, that potatoes, mangel-würzel, and carrots, only fatten in so far as they are conjoined with straw, grain, bran, or oil-cake, in which fatty matter is present. They have made no published experiments upon turnips, but they are inclined to regard all roots as very much alike in this respect. Experiments upon potatoes have been made in this laboratory, to which I shall advert on a subsequent occasion. At present it is sufficient to observe that the quantity of fatty matter found in these turnips does not permit the opinion of the French chemists to be applied to them. Those raised by dung contain fat enough to supply as much as is necessary for laying on 3 lbs. of live weight a-day, very much more than is usually acquired by fattening cattle. Although, therefore, an ox may fatten quicker when, in addition to turnips, other food fitted to qualify their watery and opening nature, or, like oil-cake, actually containing more fatty matter, is given along with them, we must, nevertheless, allow to the turnips their fair share of fattening property, and ascribe to their constituents a portion of the fat contained in the flesh of the animals we feed upon them.

Other turnips also may be richer in oil, even than these dung turnips, and thus may be more valuable to the stock farmer. It is very desirable, therefore, that numerous other carefully-made determinations of this ingredient should be made in turnips of different kinds, grown upon different soils, and by the aid of different means, in order that their theoretical and practical value as *fatteners* may be more fully ascertained.

* For some of these, see Stephens's Book of the Farm, vol. ii., p. 122.

3°. *Quantity of sugar and gum.*—The two varieties differ remarkably in the proportions of sugar and gum they respectively contain. Thus there were found per cent. in each—

	Dung Turnips.		Guano Turnips.	
	Undried.	Dried.	Undried.	Dried.
Gum,	0.27	2.27	0.19	1.57
Sugar,	5.37	44.82	1.64	13.59
Sum,	5.64	47.09	1.83	15.16

Whatever may be the immediate value of the gum and sugar, therefore, or the purpose they serve in the feeding of animals, it is obvious that the guano turnip is much less rich in these ingredients, and would by many be pronounced to be much less nourishing as food for cattle. And for this opinion there would, indeed, be very strong grounds, were it not that the turnip contains certain other substances not present in grain or straw, or even in potatoes, which may serve the same purpose in the economy of the animal as the gum and sugar do, and may thus supply their place. These substances are known at present by the names of the *Pectic* and the *Meta-pectic* acids. They exist in the turnip, the carrot, and the beet, and in the apple, the plum, and nearly all similar fruits.

4°. *Pectic and Meta-pectic Acids.*—Under these names I have included the several substances extracted by a solution of carbonate of soda from the rasped and well washed substance (mark) of the turnip. These two substances also exist in the two turnips in very different proportions. The per-centage of each was as follows:—

	Dung Turnips.		Guano Turnips.	
	Undried.	Dried.	Undried.	Dried.
Pectic Acid & a little Albumen,	1.24	10.35	0.71	5.88
Meta-pectic Acid,	3.00	35.04	6.77	56.09
Sum,	4.24	45.39	7.48	61.97
Add the Sugar and Gum,	5.64	47.09	1.83	15.16
Total sum,	9.88	92.48	9.31	77.13

The difference between 9.8 and 9.3, the total sum of all these substances contained in the undried turnips, is only one-half of a per cent., or half a pound in the hundred pounds, in favour of the dung turnips. If, therefore, the pectic and meta-pectic acids serve the same purpose in the animal economy as the sugar and gum do, the relative values of the two turnips, in respect of these constituents, is very nearly the same. The mere determination of the sugar and gum in a turnip also give little satisfactory information in regard to their real feeding values. I shall take a future opportunity of explaining in what way all these substances

act in the animal economy, and, as they have a slight difference in economic value, what is the nature and extent of that difference.

5°. *Albumen.*—The albuminous substances are those which serve to lay on muscle. By an oversight, the albumen in these analyses was not separated from the pectic acid. It is, however, very small in quantity, though the proportion varies very much in different turnips, and it would have been interesting to know what proportion these turnips contained respectively. In other turnips, now under examination, it has been found to vary between one-fourth and three-fourths of a pound in a hundred pounds of the fresh root. The exact results will be given in a future paper.

In the composition of the organic part there is little else that requires special explanation. I shall here, therefore, append the tabular result of the entire analysis of this part of the turnip :—

	Dung Undried.	Guano Undried.	Dung Dried.	Guano Dried.
Water,	88.02	87.93		
Oil,	0.25	0.16	2.09	1.26
Gum,	0.27	0.19	2.27	1.57
Sugar,	5.37	1.64	44.82	13.59
Pectic Acid and Albumen,	1.24	0.71	10.35	5.88
Meta-pectic Acid (?)	3.00	6.77	25.04	56.09
Cellular or Woody Fibre,	1.22	1.81	10.18	15.00
Saline Matter and Ash,	0.68	0.70	5.68	5.80
	100.05	99.91	100.43	90.19

(2.)—Of the Inorganic Part.

1°. *Proportion of saline matter.*—The proportion of ash left by both turnips was very nearly the same, being about seven-tenths of a-pound from each hundred pounds of the fresh root, or 5½ lbs. from 100 lbs. of the dry. The exact numbers are given in the above table. The epidermis, or skin, in its recent state, left as much as 2 per cent. of ash.

2°. *Soluble matter in the ash.*—The quantity of soluble matter contained in the ash was very nearly the same in both. Thus of 100 parts of the ash, water dissolved—

	per cent.
From the Dung Turnips,	69 8
... Guano do.,	68.72

Considerable differences, however, were observed in the proportion of soluble matter in the ash of different parts of the same turnip, upon which I do not insist at present. They will form the subject of future research.

3°. *Composition of the ash.*—But the most striking differences were found in the relative proportions of the more valuable con-

stituents of the ash. It is unnecessary to insert the entire analysis, which might only perplex many readers, since the proportions of the following ingredients sufficiently shew the most important differences:—

	Dung.	Guano.
Chloride of Potassium,	9.72	6.45
Potash and Soda,	45.49	36.29
Magnesia,	1.23	0.39
Lime,	10.17	11.56
Sulphuric Acid,	17.36	16.86
Phosphoric Acid,	7.73	19.39

The most striking differences in the above numbers—which have been obtained by my assistant, Mr Fromberg—are opposite to the potash and soda and the phosphoric acid. The former are in larger proportion in the dung turnips, the latter in the guano turnips. The former difference is less in quantity, and is, perhaps, also of less consequence; the latter is comparatively great, and refers to a substance which is confessedly of great importance in the feeding of animals.

Without phosphoric acid the bodies of animals could not be formed, and their lives could not be sustained. Every hundred pounds of the flesh of animals contain about one-third of a-pound, while fresh bones contain about one-fourth of their whole weight of this phosphoric acid. It is, therefore, a very interesting circumstance that one of these turnips should contain so much more of this important substance than the other, and one which cannot fail to affect their respective values in the feeding of stock.

The difference in the quantity of phosphoric acid is one for which we can readily account by the larger proportion of this substance which is contained in the guano than in farm-yard manure. The roots have consequently absorbed it in larger quantity, and deposited it in the bulbs in greater abundance. The present state of our knowledge entitles us to expect that the manure should exercise some influence of this kind upon the composition of the inorganic matter taken up by our cultivated crops, but I confess I am not prepared, from this one example, to infer that differences so great as the present are likely to be the uniform result of the use of unlike manures. It is of great consequence, I think, that this research should be continued, and that, by repeated analyses, the truth should be satisfactorily ascertained.

We can also readily point out the kind of stock to which turnips, containing these different proportions of the phosphoric acid, may be most economically given. Growing animals, which are increasing their weight of bone, require more phosphoric acid than those in which the bones are already fully formed. The dung turnips, therefore, by theory, should be more profitably

given to full-grown and fattening stock, the guano turnips to young animals which are still growing.

I may here introduce the result of the only other analytical examination which has yet been published of the effect of guano upon the nature of the ash of plants manured by it, though it has reference to a plant which is of no value in an economical point of view.

Vogel selected two plants of *Fuschia fulgens* in a garden, planted them in pots in two portions of the same soil, and manured the one with guano, while he added nothing to the other. At the end of the season he took both plants, dried and burned them, and analyzed the ash. His results were as follow :—

a. The manured plant lost by drying 86½ per cent. of water, the unmanured only 81 per cent. That is, the former, from having grown more rapidly, was more vascular, and had not made so much wood in proportion to its bulk.

b. The dry manured plant left 6.2 per cent. of ash, while the unmanured left 7.5 per cent. Vogel considers this difference to be of some importance. I do not think, however, that any stress is to be laid upon it, for reasons which I shall have an opportunity of stating hereafter.

c. Of the ash from the manured plant, however, 41½ per cent. was soluble in water, from the unmanured only 22 per cent. This soluble part consisted of common salt, sulphate of potash, and the carbonates of potash and soda. This was a very striking difference, and shewed that the saline matter of the guano had been taken up in considerable quantity by the manured plant, no doubt to the promotion of its growth.

d. On the other hand, the insoluble carbonates of lime and magnesia were present in the following proportions in the ash :—

	Manured.	Unmanured.
Carbonate of Lime, ...	25.4	40.2
Carbonate of Magnesia, ...	27.1	23.7

The proportions of phosphoric acid in the two were almost identical. It will be recollected, however, that it is in the seed, and not in the stem of a plant, that this acid exists in large proportion. This experiment of Vogel, therefore, merely shews that plants in general, when manured with guano, take up and retain a larger proportion of saline matter ; but it throws no further light upon the question how far plants which are cultivated for food—seeds and roots especially—are likely to appropriate a larger proportion of the phosphates when they are more largely applied to their roots in the form of manure. J.

II.—Of the RELATIVE FEEDING PROPERTIES of the above SWEDISH TURNIPS, grown by means of FARM-YARD DUNG and of GUANO.

"The following experiment was undertaken at Lennox-love, by Mr William Goodlet, under the directions of Lord Blantyre, with a view to test the feeding qualities of Swedish turnips grown with farm-yard manure as compared with those grown with guano. From the turnips being long stored, and other substances used in the feeding of the cattle, the experiment may not of itself be held sufficient to establish the fact to which its results would seem to point; but these are, nevertheless, very interesting, and such as to render a farther investigation of the subject desirable.

"The cattle were of the Angus breed, three-year-olds, part of a lot bought in at the September Falkirk Tryst last year, (1843.) After a month's grass, they were put into a feeding-court on full turnips, besides an allowance of 3½ lbs. of oil-cake each beast per day. On the 22d January they were divided into two equal lots, weighed, and put into separate courts. For *six* weeks both lots were fed on turnips grown with half dung half guano, and their usual allowance of oil-cake. At the expiry of that period they were again weighed, and lot 1 put on turnips grown with guano, and lot 2 on turnips grown with farm-yard dung. Along with their turnips they received the usual allowance of oil-cake, and on the 18th March a like weight of bean-meal in seeds was also given, and continued throughout the experiment. In this respect both lots were treated exactly alike.

"The turnips were lifted from the field in the beginning of December, and stored in pits covered with straw in the usual way. *Those grown with dung did not keep so well as those grown with guano;* many of the former being spoiled and thrown aside, while the latter were generally sound and well preserved to the last. The produce of each is given in a table below.

"The following table exhibits the *live* weight of the cattle at the periods mentioned:—

Weight 22d January.		Weight 6th March.		Weight 19th April.	
Lot 1.	Lot 2.	Lot 1.	Lot 2.	Lot 1.	Lot 2.
lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1206	1375	1288	1493	1296	1546
1306	1190	1395	1251	1400	1283
1043	1214	1079	1252	1182	1298
1157	1102	1249	1171	1328	1313
1272	1115	1312	1143	1342	1212
5984	5996	6323	6310	6548	6652

"Throughout the experiment, lot 1 ate rather more turnips than lot 2; the former having consumed, during the first period of six weeks, at the rate of 110 lbs. each beast per day, and during the second period of six weeks at the rate of 105 lbs. each beast per day; while the latter lot, during the same period, consumed only at the rate of 100 lbs. and 95 lbs. each beast per day respectively. During the first period, therefore, lot 1 consumed 10.803 tons of turnips, and increased in weight 339 lbs., or for each ton about $31\frac{1}{3}$ lbs.; and lot 2 consumed 9.820 tons, and increased in weight 314 lbs., or for each ton $31\frac{3}{4}$ lbs. Again, during the second period, lot 1 consumed 10.312 tons of turnips, and increased in weight 225 lbs., or for each ton about $21\frac{3}{4}$ lbs.; and lot 2 consumed 9.330 tons, and increased in weight 342 lbs. or for each ton about $36\frac{1}{2}$ lbs.

"For easier comparison, these results are given in a tabular form thus—

	During First Period.		During Second Period.	
	Lot 1.	Lot 2.	Lot 1.	Lot 2.
Turnips consumed,	10.803 tons.	9.820 tons.	10.312 tons.	9.330 tons.
Increase of Live Weight, . . .	339 lbs.	314 lbs.	225 lbs.	342 lbs.
Increase of do. for each Ton of Turnips consumed,	$31\frac{1}{3}$ lbs.	$31\frac{3}{4}$ lbs.	$21\frac{3}{4}$ lbs.	$36\frac{1}{2}$ lbs.

"It hence appears that, during the first period of six weeks, when both lots were fed on the same description of turnips, (namely, those grown with dung and guano,) they increased in almost the same ratio; but during the second period, when No. 1 was put on turnips grown with guano, and No. 2 on turnips grown with dung, the latter gained over the former in weight 117 lbs., or, if the quantities of the turnips consumed be taken into the calculation, the gain is in the proportion of $36\frac{1}{2}$ to $21\frac{3}{4}$.

"The turnips used in the above experiment were from the same seed, sown the same day, and grown in adjoining plots of the same field. The produce, with the quantities and cost of manures are given in the following table, to which are appended columns shewing the value of the crops, calculated according to their feeding qualities as ascertained by the above experiment.

Manures.	Quantity per Imperial Acre.	Cost.			Appearance of Turnips.	Produce of Bulbs.	Increased Live Weight of Cattle for each Ton of Turnips Consumed.	Value of Crop, (exclusive of the Dung made from it in feeding,) estimating increased Live Weight of Cattle at 3d. per lb.
		L.	s.	d.		tons.	lbs.	L. s. d.
Guano, . . .	6½ cwt.	4	4	6	Coarse	17.500	21¾	4 15 6
Dung, . . .	24 cart loads.	5	5	0	Fine.	17.142	36½	7 16 5
Rape-dust, .	16 cwt.	4	0	0	Fine.	16.830	....	....
Guano and Dung,	12 carts, 3¼ cwt.	4	16	3	Fine.	14.907	31¾	5 18 10

"This table exhibits guano in no very favourable light; but it would be rash, from a single experiment, to conclude that its qualities as a manure have been over-estimated. In this experiment it is possible that some undetected element of error may have crept in to affect the results. From other substances having been used in the feeding of the cattle, *the possibility of their thriving better at one period of the experiment than at another*, and from other circumstances which need not be enumerated, it is by no means improbable that the results obtained may be fallacious. They are such, however, as deserve the attention of practical agriculturists, involving, as they do, a point of so much importance with reference to the value of guano as a manure, and ought to induce some of their number to repeat the experiment, in order to determine, by a comparison of several trials, whether the feeding qualities of turnips grown with that manure are really so inferior to those grown with dung as the present experiment would seem to indicate." W. GOODLET.

GRANT'S BRAES, 10th May 1844.

Remarks.—This experiment of Mr Goodlet's is remarkably well made and clearly described. The result is very striking; but I quite agree with Mr Goodlet that the result of a single experiment is not sufficient to settle a question of so grave and economical a character. It is, however, sufficient to stimulate to further inquiry, and I hope will be the means of inducing many to make similarly accurate experiments upon the feeding properties of the produce they raise. Such experiments are desirable, not only because they are likely to lead to immediate economical results, but because of their connexion with most important theoretical questions, the true decision of which can only be arrived at by numerous and carefully reported practical inquiries of this kind.

I have been favoured with a practical observation by Mr Campbell of Craigie, Ayrshire, in reference to the value of guano turnips, which appears to me to be of great importance. He says—

"I was considerably alarmed when I compared your analysis with the fact that both my cattle and my sheep had come to a stand still when fed upon one lot of my guano-grown turnips. I have, however, got quit of my fears for the use of guano as a turnip-growing manure, by further inquiry, which has satisfied me that the cause of the difference in my case is in the different state of growth of the two lots grown by dung and by guano. My guano turnips (Swedes) which were first used were sown early, and grew very rapidly, being on fine land, and were stringy, and did not feed well; while those grown with guano on bad land, and just used, (May 1844,) after coming to their bulk, did not grow in the stem, as the others had done, and *fed well*. None of my neighbours (in Ayrshire) had any fault to find with their guano turnips."

There can be little doubt, I think, from this remark of Mr Campbell's, that the period of maturity at which two lots of turnips have respectively arrived, materially affects their value in adding weight to the stock that may be fed upon them.

Mr Aitchison of Drummore, near Musselburgh, whose practical skill and zeal in agricultural improvement are so well known, informs me that not only has guano given him this season the largest crop of turnips he ever saw, but that the turnips themselves are causing his cattle to thrive in a very remarkable manner.

Though these observations tend to remove the apprehensions which might naturally be entertained by feeders of stock in consequence of the result of Mr Goodlet's experiment, and to prevent the value of guano as a manure from sinking in general estimation, that experiment is still of great interest and importance. Those who have the opportunity during the present winter will confer a benefit upon the agricultural community by carefully repeating these experiments, with turnips of different kinds, and at different stages of their growth.

Such experiments are also to be desired with turnips raised by other portable manures as well as with guano. Mr Mylne of Bolton, near Haddington, who has long been in the habit of using rape-dust very extensively for his turnip crop, informs me that he is satisfied such turnips do not feed so well as those raised by dung. How valuable would precise experiments be!

Before concluding, I would draw the attention of the reader to a physiological fact of some interest, which may be extracted from Mr Goodlet's results. Each of his lots contained five beasts, and he has in his calculations taken into account only the general increase of each lot at the end of each period. His first table, however, enables us to determine the increase of weight of each beast at the end of each period, and the comparison of the numbers thus obtained is very curious. Thus, taking the two sets of beasts in the order he has represented them, we have the increase in pounds:—

During First Period.		During Second Period.		Total Increase.	
Lot 1.	Lot 2.	Lot 1.	Lot 2.	Lot 1.	Lot 2.
Half Dung and Half Guano.		Guano.	Dung.		
82	118	8	53	90	171
89	61	5	32	94	93
36	38	103	46	139	84
92	69	79	142	171	211
40	28	30	69	70	97
338	314	125	342	564	656

This table shews remarkable differences in the rate and time of growth of the several beasts. Thus the first two in lot 1 did little else than manufacture dung during the second period, when fed upon the guano turnips, while the third beast in that lot increased three times as much upon the guano turnips as it had done upon those grown with half dung and half guano. Then of the second lot the first beast grew amazingly upon the half guano turnips, but fell off in its growth very much when put upon the dung turnips, while No. 4, in the same lot, added 142 lbs. to its weight while fed upon these turnips. These differences are the result of age, constitution, health, previous feeding, and perhaps also of the quantity of food taken by each during the experiment. To make a fair experiment, therefore, it is not enough that the animals should be nearly of the same weight; they should be also as nearly as possible of the same habit of body, in the same state of health, of the same age and stage of growth, and have been, for a length of time, subjected to nearly similar treatment; or, when these things cannot be obtained, a larger number of beasts must be put up together, so that, from differences of all kinds existing among them, an average result may be obtained which shall approximate to the truth. The greater the number the less the risk of erroneous conclusions. Could the quantity of food consumed by each animal in the several lots be also determined, it would throw much new light upon this important subject of inquiry.

J.

III.—ON THE OVER-LIMING OF THE LAND.

The term *over-liming* is one which is well known to practical men, especially in the northern end of the island.

It has been long observed that, after land has been frequently limed, and kept under arable culture for a series of rotations, it gradually acquires a lighter and more open character. It thus

becomes less fitted for the growth of those plants which delight in stiff and compact soils; the winter wheat, for example, becomes less certain, and is apt to be thrown out by the frost. It is partly in affording a remedy for this evil that the rolling and pressing of wheat lands has been found of so much advantage in our own and in foreign countries.

But in soils which are naturally light, and especially in such as abound in vegetable matter—in peaty and moorish districts which have been reclaimed by the aid of lime among other means—this opening up or loosening of the soil often takes place to a very much greater extent. The surface appears to be heaved up, and the land sounds hollow, and sinks under the foot. This appearance has so often been observed, or supposed to follow from the application of large doses of lime, that it is usual among practical men to speak of it as the immediate effect of *over-liming*, and to pronounce, wherever it is observed, that the land is *over-limed*. In this loose and open state, turnips, potatoes, and barley thrive well upon it, but oats and clover sometimes almost fail.

In a theoretical point of view, I considered it very interesting to inquire, by analysis, whether soils in this condition really contained a large per-centage of lime—whether they contained so much more than other soils, on which the same consequences had not followed from the application of lime, as to justify the opinion that the excess of lime added (the *over* quantity) was really the sole cause of the loose, friable, and, in some respects, unproductive characters which they had assumed.

I was enabled to do this during the past year, in consequence of Sir George Macpherson Grant—whose extensive improvements at Ballindalloch have attracted so much attention in the north of Scotland—having sent a number of the soils from this estate for analysis in the laboratory of the association. Among these soils were several which were *over-limed*, which had the loose, open, hollow character I have described, which yielded to the foot, and which refused to grow profitable crops of oats and clover. To some of them the lime had been applied as far back as thirty years ago, and it was stated that, immediately after the application, several luxuriant crops of oats had been reaped, but that since that time the crops of this grain had been comparatively unprofitable.

These soils are still in the state which is called over-limed. Is this state actually owing to the presence of a large per-centage of lime? An appeal to analysis answers this question distinctly in the negative. I insert here the composition of five of these soils from different parts of the estate.

Analysis of Soils from Ballindalloch.

	1. Bowmoon Park Soil.	2. Bowmoon Park Subsoil.	3. Mistly Park Soil & Subsoil.	4. Sutherland Pk. Soil & Subsoil.	5. Carron Park Soil & Subsoil.
Organic Matter,	10.29	9.54	5.65	5.73	5.23
Salts soluble in water,	0.45	0.15	0.50	0.15	0.44
Oxide of Iron,	2.49	3.68	0.50	0.96	2.04
Alumina,	1.71	2.54	1.11	1.43	1.15
Carbon. of Lime,	1.40	0.69	1.10	0.98	0.67
Oxide of Manganese,	trace	0.72	trace	trace	0.22
Carbonate of Magnesia,	trace	trace	trace	trace	trace
Earthy Matter,	81.77	82.79	91.20	90.34	89.60
	98.11	100.11	100.06	99.64	99.35
By washing—					
Clay & Fine Sand,	49.72	78.00	72.14	76.36	71.00
Coarser Sand,	50.28	22.00	27.86	23.64	29.00
	100.00	100.00	100.00	100.00	100.00

In none of these soils does the quantity of carbonate of lime amount to one and a-half per cent. But in some fertile soils, which are capable of growing luxuriant crops of wheat, the quantity of carbonate of lime amounts to as much as *forty* per cent. It cannot be to an excess of lime, therefore, that their peculiar physical condition and unproductive character are owing. On the contrary, as almost all soils which are eminent for their fertility contain a much larger proportion of lime than any of these Ballindalloch soils in their present state do, it might with more justice be concluded that their comparative infertility was in part, at least, owing to the presence of too small a proportion—owing, in short, to the want of lime. But to this point I shall return.

Two other points are deserving of notice in these soils—1*st*, That they are all comparatively rich in vegetable matter—the surface of most of the land indeed appears to be of a moorish black heathy character, such as naturally suggests the use of lime in improving it, when broken up and brought into arable culture. 2*d*, The light and sandy character of all of them, to which their healthy character is no doubt in part at least originally owing. They contain, for instance, less in general than two per cent. of soluble alumina, which gives tenacity to the soil, and from 80 to 90 per cent. of insoluble matter, which is principally quartz sand. These facts are of importance in connexion with the curative

treatment to which the soils ought to be subjected, and to which I shall presently advert.

It does not appear, therefore, that the soils contain too much lime at present—it may be doubted if they ever contained more than was necessary to keep them in profitable tillage. But, from some cause or other, the land has been brought into a mechanical condition which is unfavourable to the growth of certain crops. How is this mechanical condition to be removed and overcome? Practical experience in some measure answers this question.

a. When the land is laid down for a time to permanent pasture, a crop of oats can be obtained on breaking up the lea. The general adoption of this practice, however, limits very much the power of growing corn.

b. Eating off the turnips with sheep is found to bring the land into a condition to bear oats and even clover. But in elevated districts, such as the uplands of Banff, Moray, and Inverness, this practice, from the prevailing cold, cannot be generally adopted.

By these two methods the land is trodden upon by cattle and sheep, and is thus solidified. It is also manured by the droppings of the stock, and, when broken up from pasture, by the roots and green leaves of the grasses which are ploughed in.

That the want of solidity is really an important defect is shewn by the kind of crops which refuse to come to perfection upon it. Oats and clover are both deep-rooted plants, and both grow most luxuriantly on a firm and somewhat heavy soil.

There are several ways in which a greater solidity may be attained where pasturage and eating off with sheep are inconvenient.

a. The method adopted by Sir George, of bringing up a portion of the subsoil, may, in some cases, be tried with advantage where the subsoil is drained, and otherwise of a quality which can be brought up without a chance of inflicting a new injury upon the surface soil.

b. It may be top-dressed with clay, or some convenient heavy compost, by which its lightness may be diminished.

c. Or, lastly, it may be pressed with a heavy roller, or other similar machine, after the grain is sown. An occasional repetition of such treatment may be expected gradually to add to the firmness of the soil, or, at all events, to protect the seed.

d. The effect of the plough in loosening the soil may also be diminished by the use of the grubber, or of Finlayson's harrow, to extirpate the weeds. A less frequent ploughing than has hitherto been practised will thus be required.

Still, it may be asked, has lime had nothing to do in causing this mechanical lightness and openness of the soil? Though the

soil contains comparatively little lime now, may it not have been the original cause of its assuming this character? I cannot doubt that it has, though not exactly in the direct way usually supposed. In the cases referred to, its action has been, I believe, as follows:—

1°. All soils in which decayed vegetable matter exists contain a certain proportion of this in the form of humic and ulmic acids, which have a strong tendency to imbibe and retain water, and thus to keep the land wet, and to give it something of a spongy character. I do not speak at present of the action of these acid substances upon the plant. When lime is added to the soil, its first effect is to combine with these acids, and, if it is in quantity sufficient, to form compounds with them which do not so retain water, have not the spongy character, and which, when dry, become friable and crumbling. Hence one source of the great benefit arising from the use of lime upon boggy, moorish, and peaty soils, which abound in vegetable matter. But this effect of the lime shews also the necessity of something to give solidity and firmness to the land where the vegetable matter is large in quantity, or when much of it is in the state I have just described. The loose and powdery state is, in some measure, a necessary consequence—where the land is tolerably drained—of the otherwise beneficial action of the lime.

2°. Most soils contain also a certain quantity of alumina—that substance which gives tenacity to the clays—in a state in which it also retains much water, takes it up readily, and contributes to give a wet and tenacious character to the land.

If a quantity of alum be dissolved in water in one tumbler and a little common soda in another, and if the two solutions be mixed, the whole will become milky. If this milky liquid be now strained or filtered through a piece of fine muslin, a white soft jelly will remain upon the cloth, which will retain much water, will dry very slowly, and, as it dries, will assume something of the semi-transparency of a bit of white rosin. If it be put again into water, it will swell out and become gelatinous as before.

This gelatinous substance is alumina, in that state in which a certain proportion of it exists in all soils, and in which state it is one source of the degree of stiffness they possess, and of their power of absorbing, retaining, and preventing the passage of water.

The addition of lime to the soil gradually acts upon the alumina as it had previously done upon the vegetable matter. If it does not combine with it, or render it insoluble, it tends, at least, to diminish its *affection* for water, to render the soil drier, therefore, more friable, and more pervious to water.

In the state above described, alumina is readily soluble in acids, and can, therefore, be extracted from the soil by their means.

The quantity of it contained in any soil depends upon its stiffness or general clayey character, the quantity of vegetable matter present in it, and upon the way it has been cropped and tilled. It performs an important chemical function in the soil, which it would be out of place here to explain.

Of alumina, in this soluble state, it will be seen, by a reference to the table of analyses above given, that the soils from Ballindalloch contain only a small proportion. They are generally sandy soils, however, and the proportion of alumina present in any other state is also small. But still there is enough for the lime to have so acted upon as to make the soil, in some degree, less stiff and tenacious than before.

3°. To the above two effects of lime is due a portion of that loosening and lightening effect which lime produces upon the majority of soils. But in the case of those which are called *over*-limed, I am inclined to attribute the *over*-lightness to another and less direct action of the lime. It brings the land into a state in which it can readily be made to grow profitable crops of corn, and thus throws a temptation in the way of the farmer which he cannot resist. Nearly all land, if dry, becomes more open and light the more it is ploughed and stirred. Such is the case with the soils in question. Naturally light, they become more so by constant cropping. When he has rent to pay, there is a sore temptation to the farmer to continue ploughing—even though the physical character of the soil is constantly altering for the worse—so long as he can reap a crop of corn yielding so much profit as will enable him to pay part of that rent when the term comes round. I cannot, of course, say with certainty, as I do not know, the peculiar *cultural history* in a single case, but I am inclined to think that much of that hollow and *hoven* quality of the soil, which has been ascribed to over-liming, has arisen from *over-working the land beyond what its physical condition would bear.* It should, every now and then, have had a rest from stirring, or have been artificially consolidated by some mechanical means. The land may not have been robbed or over-cropped in the ordinary sense—its valuable chemical constituents may not have been exhausted—and yet, as is here the case, it may have been rendered *physically* unfit for the healthy and luxuriant growth of some of our more valued crops.

4°. I have elsewhere* assigned another cause as probably contributing in some degree to this lightening of the land, and which is naturally suggested by the hollow and apparently blown-up character of the soil. A certain part of the lime laid on combines immediately with the acid matter in the soil, the rest is soon con-

* Elements of Agricultural Chemistry and Geology, 4th ed. p. 212.

verted into carbonate—brought into the state of chalk. As new acid matter is produced, it decomposes this carbonate, and liberates its carbonic acid in the state of gas. This same gas is also liberated in other ways in the soil, partly through the agency of the same lime. It does not appear impossible that the gas thus liberated should gradually separate the particles of a light soil from each other, and thus heave up the whole, as it were, and make it lighter still.

I would not lay any great stress, however, upon this cause or mode of action. An argument against it presents itself in the consideration that, in a soil already light and open, it will be unnecessary for any gaseous matter which may be liberated to *force* its way to the surface, or to make an outlet for itself by thrusting aside opposing particles of earthy matter. This may be necessary in gelatinous peaty soils or in stiff impervious clays, but cannot often be required, one would think, in such as are naturally light and open.

5°. It is not unlikely, however, that the loosening of such soils, which follows from the repeated ploughings, may be aided and accelerated on high grounds by the freezing and expansion of the rains or melted snows during the winter months. The more it is loosened the more water it will absorb; and, if the subsoil be retentive, the more it will retain, the more it will be swelled out by the freezing of the water, and the more it will be opened and loosened by every winter's frost. And as the addition of lime to the soil has previously given it friability, and a certain increased degree of porousness, the action of the frost may produce more perceptible consequences after it has been applied than were ever perceived before. The remedy for this evil action is to insert drains which will so readily carry off the water that it shall be unable to linger and freeze in the land.

The chemical examination of this question, then, has thrown much light upon the whole subject. For though it has not suggested a direct chemical remedy for the evil, it has shewn what the nature of the evil really is, what is its probable cause, and what kind of steps should be taken to remove or prevent it. It presents a good illustration indeed of the way in which chemical inquiry is fitted to improve and give confidence to agricultural practice, without putting into the hand of the farmer any new chemical materials to work with, or prescribing to him any new processes which involve a previous knowledge either of the language or science of chemistry. A result is arrived at which can be stated in clear and intelligible language, and a method of practice is suggested, which, though it is deduced from a laborious chemical analysis, bears no evidence of having been arrived at through the crucible or the retort.

But, another direct suggestion, and one of a chemical kind, is drawn from the above analyses, in reference to the soils of Ballindalloch actually examined. Their evil qualities having arisen, as it is believed, from *over*-liming, the practical man would scarcely venture to add more lime, with the view of improving them in any way. I was, indeed, informed, when in Fife some time ago, of a case where over-limed land was cured by a new addition of lime; but the term over-liming naturally suggests a different course, and deters the farmer from laying on what he conceives to be the cause of the evil. But analysis shews that these Ballindalloch soils are generally deficient in lime, and advises, among other means of improving them, that lime should be added in considerable quantity. On such soils, however, it ought to be laid in the state of compost, and in moderate doses frequently repeated. It may also be advisable to mix with it a twentieth of its weight of common salt. To other over-limed soils it may be inexpedient to add lime, but that can only be determined by the analysis of the soil in each particular case.

In regard to these Ballindalloch soils, therefore, the hopes of cure must rest upon draining to remove the superfluous moisture—upon rolling or bringing up subsoil—occasional rest in pasture or eating off with sheep, to consolidate them—on the addition of lime compost in small doses, to increase the proportion of this indispensable element of fertility—and of guano or similar manures to supply what the oat crops of former years have carried off the land.

I am myself obliged, and I am sure the members of the association will feel indebted, to Sir George Macpherson Grant, for the opportunity he has afforded me of investigating this interesting subject. J.

IV.—ANALYSIS OF LIMESTONES.

From Relig, near Inverness.

One of the objects of the Association being to make generally known the best means and instruments of agricultural improvement which are within the more direct reach of the farmer in each district, I have thought that this end might be in some measure promoted by the publication, from time to time, of the analysis of the more valuable of the numerous limestones which are sent for analysis by the members of the association. For the present I select two limestones from a comparatively remote district near Beauly, to the west of Inverness, where limestone, I believe, is rare, and where it may therefore be of consequence to

the neighbourhood that their good qualities should be made known. Two specimens of this limestone, which burns white and falls readily, were sent to me by Mr Frazer of Relig, on whose property they are quarried, and, upon analysis, they were found to consist of—

	Superior Specimen.	Inferior Specimen.
Carbonate of lime,	93.82	94.10
Carbonate of Magnesia,	1.64	1.00
Alumina and Oxide of Iron,	0.99	2.16
Insoluble Siliceous Matter,	3.55	2.74
	100.00	100.00

They are, therefore, very valuable limes. They contain comparatively little siliceous matter—enough to make them good building limes, but not so much as to prevent them slaking freely and falling readily to powder when exposed to the air in heaps, in the way usually adopted for agricultural purposes. It is of importance also that, while they contain a sufficiency of magnesia to supply the wants of the grain, they do not contain enough to prove at all injurious to the crops. J.

V.—GROWTH AND COMPOSITION OF FURZE.

In regard to the growth of furze, a correspondent in the county of Cork writes me as follows :—" In the western part of this great county, and in many parts of the north of Ireland, furze (*Genista spartium*) occupies a prominent place as food for cattle. A friend of mine, who lives at Dunmanway, in the mountainous parts west of Bandon, feeds every year two or three hundred head of cattle, from the 1st of November to the following May, on chopped furze only, Sunday excepted, when they get turnips. I have not seen finer or healthier cattle in Ireland; and all this on a small mountain farm not exceeding 400 acres, (Irish?) This farm, some years ago, was valued at 1s. 6d. per acre—it is now worth £5. Furze is now grown as wheat or clover, and lets, after the first year, at £5 per acre all over this county, (Cork.)" The only analysis of furze yet published is by Sprengel, and, as several members of the association and others have written to me to know something of its composition, I insert here Sprengel's results. I have not myself had an opportunity of examining it :—

1°. *Organic part.*—Water, 50.00—Albumen, Gum, Salts, and a little bitter Extractive Matter, 9.67—Matter soluble in diluted Potash, 13.38—Wax, Resin, and Fatty Matter, 2.76—Woody fibre, 24.19——Total, 100.00.

2°. *Inorganic part, or Ash.*—The quantity of Ash it leaves is 0.938 p. ct. wet—1.876, dry. This Ash consists of—Potash, 37.31—Soda, 5.76—Lime, 13.75—Magnesia, 2.99—Oxides of Iron and Manganese, 0.53—Alumina, 0.21—Sulphuric Acid, 6.39—Phosphoric Acid, 11.52—Chlorine, 8.00—Silica, 13.54——Total, 100.00 per cent. J.

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For "Pages 5 and 6," referred to throughout these Premiums, *read* "Pages 229 and 230."

PRELIMINARY NOTICE.

THE business of THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND is conducted by a President, Four Vice-Presidents, Thirty Ordinary, and Ten Extraordinary Directors, a Treasurer, an Honorary Secretary, and a Secretary, to which last all communications are addressed. The Ordinary Directors are subdivided into Committees for the despatch of business, assisted occasionally by those Ordinary Members most conversant with the subjects to be considered, or with the duties to be discharged. The report of each Committee is brought before the Directors collectively for farther procedure, and their proceedings are again submitted for approbation to a half-yearly General Meeting of the Society. One of the General Meetings is, by the Charter, appointed to be holden on the second Tuesday of January; the other on such day in the months of June or July as the Directors may fix. New Members are admitted at either of these General Meetings by ballot. They pay a small annual contribution of L.1 : 3 : 6, or, in their option, and in full of all future claims, a life subscription of Twelve Guineas. The Annual Subscription is payable in advance, and is expected to be so paid or remitted, by the Members who are liable in it, without expense to the Society. All Meetings of Directors, or Committees, are open; and at these any member may attend and deliver his opinion on the subjects under consideration, though, in cases of division, the Directors or Members of the Committees only are entitled to vote. Members have access to the Society's Library, which is annually increasing by the purchase or donation of books connected with the purposes of the Institution.

When the Highland and Agricultural Society of Scotland was instituted in the year 1784, the object chiefly contemplated was the improvement of the Highlands, and hence the name—THE HIGHLAND SOCIETY OF SCOTLAND—which it then assumed. But the great increase in the number of its Members since that time, the happy management of its funds, and the change in the general state of the country, have long enabled it to extend the design of its first institution, and direct attention to every part of North Britain where industry might be excited or the useful arts improved. In accordance with this extension of the purposes of its institution, the Society, in its Supplementary Charter, has been named THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND.

The Society has, neither by its Charters of Incorporation, nor by its practice, been limited in its patronage to any one department of industry; but it has regarded as the fitting objects of encouragement, every application of useful labour which might tend to the general good. But, although its patronage be thus extended as regards its objects, circumstances have arisen to modify, in some cases, the application of it. The establishment of certain Boards, for the encouragement of the Herring Fishery, and the like, has induced the Society to restrict its original views, and to devote its attention, and apply its funds, in a more special manner, to other objects, and chiefly to Agricultural and Rural Economy in their various branches.

In fulfilment of its purposes, the Society is every year accustomed to offer and award a variety of Premiums, as the means of eliciting and diffusing knowledge, as incitements to industry, or as the rewards for useful undertakings. These relate to every subject which may be supposed to fall within the plan of the Institution:—such are, the Improvement of Waste Lands by Tillage, by Irrigation, or by Draining, the development of the Mineral Products of the country, the extension of Plantations, as the objects of ultimate profit,

or of present embellishment and shelter,—the improvement of the breeds of Live Stock, and of the qualities of Wool,—the encouragement of certain domestic manufactures,—and, not the least in interest and importance, the awakening the industry of the Lower Ranks to such pursuits as shall promote their content, by ameliorating their condition. A Mechanical Department exists for rewarding the original invention or subsequent improvement of all machines and implements for Agricultural purposes, the construction of those for other branches of Rural Economy, and of some for domestic convenience. Models of these are received and preserved in the Society's Museum; and descriptions of all such as merit attention are as speedily as possible conveyed to the public.

Although certain subjects be thus selected as the objects of experiment or discussion, the patronage of the Society is not restricted to these objects. Its purposes being the promotion of general industry and improvement, it receives with favour every beneficial communication, and every statement of facts which may admit of an useful application.

The papers of the Society are printed periodically in "THE JOURNAL OF AGRICULTURE, AND THE TRANSACTIONS OF THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND," published by Messrs. BLACKWOOD, 45, George Street, Edinburgh, and 22, Pall Mall, London.

The Society is prepared to receive with attention all written communications, in the form of Essays, Reports, Notices of Experiments, and the like, which may be presented to it by LOCAL ASSOCIATIONS. Such communications, if approved of by the Society, will be inserted in the Transactions; and opportunity will be given to the Authors or Associations of obtaining separate copies from the types for circulation in the district.

All communications relating to Premiums, as well as Papers or Reports for publication in the Transactions of the Society, and other subjects for the consideration of the Directors, are to be addressed to SIR CHARLES GORDON, the Secretary of the Society, at the Society's Hall, Albyn Place, Edinburgh.

NOTICE TO CANDIDATES,

AND GENERAL RULES FOR COMPETITION.

When subjects are specially selected for competition, it is always to be understood, 1st, That however concisely the subjects themselves be announced, ample information is required concerning them—2d, That this information shall be founded on experience or observation, and not on simple references and quotations from books—3d, That it shall be digested as methodically as possible,—and 4th, That Drawings, Specimens, or Models, adapted to a defined scale (3 inches to the foot if convenient), shall accompany writings requiring them for illustration.

Certain conditions are annexed to each of the various subjects of competition, as detailed in the List of Premiums; and these are rigidly enforced by the Society, as the only means of insuring regularity in the conduct of the business, and of distributing exact justice among the competitors.

In all Essays for Competition for Premiums offered, it is expected that when facts not generally known are stated, they will be authenticated by proper references. Competitors in Essays and Reports are required to quote, or state distinctly on the top of the first page of their paper, the *number* and *title* of the subject or Premium for which they compete. They will not communicate their names, but shall transmit along with the Essays a sealed note, con-

taining their names and addresses, and inscribed on the back with some distinguishing motto or device, which shall also be inscribed on the Essay. When this regulation is neglected, such Essay shall not be received in competition. If the Essayist has formerly gained a Premium from the Society for a Paper communicated by him, it is recommended, that his subsequent Essay shall be written in a different hand from that of the former successful Paper. Surveys, Essays, or Reports of considerable length, must be bound, or inserted in a book, to facilitate their perusal.

None of the sealed notes, except those that bear the distinguishing motto or device of the Essays found entitled to Premiums, will be opened, and the sealed note will not, in any instance, be opened, without the consent of the author, unless a sum equal to, at least, one-half of the Premium offered shall have been adjudged. But should no application be made for the paper on or before the 1st of March in each year, it will be held as belonging to the Society on the terms proposed. Such Essays as are not found entitled to any Premium will, with the sealed notes, be returned to the authors if required. The Society is to be at liberty to publish the Essays, or extracts from them, for which the Premium, or part of it, shall be awarded.

Candidates are requested to observe, that, in any instance, when Essays, Reports, or Certificates are unsatisfactory, the Society is not bound to give the reward offered; and that, in certain cases, power is reserved of giving such part only of a Premium as the claim may be adjudged to deserve; but competitors may feel assured, that the Directors will always be inclined to judge liberally of their several claims.

Essays, Reports, or Communications, on subjects for which Premiums have in former years been offered, will still be received, although the subjects may now be discontinued on the List, and Honorary awards will be voted, when the communications appear to merit them.

Essays and Reports, for which no Premiums have been awarded, must, if desired to be returned, be called for within one year from the date of Competition, otherwise the Society will not be responsible for the papers.

Competitors will understand it as a condition having reference to every Premium and Reward offered by the Society, that the decisions of its Committees and Board of Directors, as confirmed by the Society, are to be final and conclusive, and that it shall not be competent to raise any question or appeal touching such decisions before any other tribunal.

In Reports of Experiments relating to the Improvement or Management of Land, it is expected that the expenses shall be accurately detailed.

In all Premiums offered, having reference to Weight or Measure, the New or Imperial Standards are alone to be understood as referred to; and Competitors are required to state their calculations according to these, the only legal standards, otherwise the claim will not be entertained.

When the Premiums are awarded in Medals or Plate, the Society will, in such cases as the Directors may see proper, allow them to be paid in money, on the application of the successful Candidates.

The Premiums awarded by the Society are payable after the 10th February, for the preceding year. Orders payable at the Royal Bank of Scotland, are issued of that date, by the Directors, in name of the parties in whose favour the Premiums have been awarded. The orders will be delivered at the Society's Hall, upon the receipts of the parties to whom the Premiums have been adjudged being presented; or the parties may transmit, through any Bank, stamped receipts, or negociate bills, addressed to the Treasurer or Secretary, if done without expense to the Society. The receipt or bill must specify distinctly the Premium in discharge of which it is sent.

Parties entitled to *Plate* or *Medals*, will, by themselves, or some person having their authority, apply at the Society's Hall for an order on the Society's Jeweller or Medallist.

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His Grace CHARLES DUKE of RICHMOND, K.G.

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1843. The Right Honourable WILLIAM, EARL of MANSFIELD.
1843. The Right Honourable WILLIAM, LORD PANMURE.
1844. The Most Honourable JOHN, MARQUIS of QUEENSBERRY.
1844. The Right Honourable CHARLES, EARL of CATHCART.

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ACCORDING TO PRIORITY IN DATE OF ELECTION.

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The Argyll Naval Fund, .	Alexander Lamont, Esq. of Knockdow.

THE SOCIETY'S MUSEUM, GEORGE IV. BRIDGE.

The Right Honourable the Earl of Cathcart, K.C.B.,
Chairman of the Committee of Superintendence.

Charles Lawson, *Conservator*. William Gorrie, *Assistant*.
James Slight, *Curator of Models*.

CHAIRMEN OF MONTHLY MEETINGS

HELD AT THE MUSEUM.

Chairman.—The Right Hon. the Earl of Rosebery, K.T.
Deputy-Chairmen.—Lord Murray ; Right Hon. Sir George Warrender, Bart. ; Sir George S. Mackenzie, Bart. ; Professor Graham.
Clerk.—Henry Stephens.

PREMIUMS.

SOCIETY'S HALL, ALBYN PLACE,
EDINBURGH, *10th February* 1844.

THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND offers the following PREMIUMS for Competition in 1844, and partly in following years:—

CLASS I.

ESSAYS AND REPORTS

ON SUBJECTS CONNECTED WITH THE SCIENCE AND PRACTICE OF AGRICULTURE.

The Society, desirous of encouraging inquiries on points connected with the Science and practice of Agriculture, will receive with favour, and reward liberally, Essays and Memoirs on the following subjects.

One Hundred Sovereigns will be awarded, in such proportions as the Directors may think proper, for approved communications on any of the subjects Nos. 1, 2, 3, and 4.

1. EXPERIMENTS WITH CERTAIN SPECIAL MANURES.

For a Report of Experiments made with different Manures, both *separately* and also *mixed in certain proportions*. Each experiment to be made *double*,—that is, on two separate portions of land of not less than half an acre each, so as that a more correct average of the effect of each substance may be obtained.

The substances employed to be Guano, Nitrate of Soda, Nitrate of Potash, Sulphate of Soda, Sulphate of Magnesia, Sal Ammonia, Sulphate of Ammonia, Carbonate of Soda, Pearl Ash, Kelp, and Bones, or mixtures of these in specified proportions. The Ammoniacal liquor of the Gas Works should also be tried; and it is particularly recommended that the refuse of any of our Manufactories, such as the Prussiate of Potash, and the animal refuse of Sugar Works, should be collected and experimented upon.

It is of importance, that the effects of such substances upon the Crops of the second and third years should be carefully observed and reported on; and though it is not indispensable that a Report, when sent in, should contain observations made for more than one year, yet a higher value will be placed upon those in which such observations shall be distinctly and carefully embodied.

The substances above mentioned, and any others of known composition which the experimenters may select, are to be tried after the following manner: A series of square or oblong portions, not less than a quarter of an acre each, are to be marked off in the field, and the different substances applied to the crop or seed upon each plot. Thus, if the substances to be experimented on be Farm-yard Manure, Guano, Bone Dust, Sulphate of Ammonia, Kelp, and Nitrate of Soda, they may be arranged as under, two plots for each.

Nothing.	Nitrate of Soda.	Bone Dust.	Guano.	Kelp.	Sulphate of Ammonia.	Farm Yard Manure.
Guano.	Sulphate of Ammonia.	Farm Yard Manure.	Nothing.	Nitrate of Soda.	Bone Dust.	Kelp.

And so on with other substances that may be employed, two plots being always reserved for each substance; the same quantity being applied upon each of the two plots, and these plots being kept at the *greatest* convenient distance from each other.

In regard to the quantity of the several substances which ought to be laid on per acre, the Society considers it desirable that separate experiments should be made upon different quantities of each substance; for example, with kelp, the double set of experiments might be arranged thus:

Kelp, 1 cwt. per acre.	2 cwt.	3 cwt.	4 cwt.	5 cwt.	6 cwt.
Do. 6 cwt.	5 cwt.	4 cwt.	3 cwt.	2 cwt.	1 cwt.

or different proportions of two or more substances might be contrasted with each other on the same field; thus:

Nitrate of Soda, 1 cwt.	Sulphate of Ammonia, 1½ cwt.	Nitrate of Soda, 2 cwt.	Sulphate of Ammonia, 1 cwt.	Nitrate of Soda, 1½ cwt.	Sulphate of Ammonia, 2 cwt.
Sulphate of Ammonia, 1 cwt.	Nitrate of Soda, 1½ cwt.	Sulphate of Ammonia, 2 cwt.	Nitrate of Soda, 1 cwt.	Sulphate of Ammonia, 1½ cwt.	Nitrate of Soda, 2 cwt.

The substances applied may be used either alone, or in addition to the whole or one-half of the usual dressing of farm-yard manure, or in any other way which the experimenter may think most likely to lead to important results.

As to mixtures, the Society considers mixtures of several substances as a more natural and profitable mode of applying them. It is, therefore, strongly recommended that experiments with mixtures of the substances above named, should form a prominent part in the new trials they are desirous to encourage. The Society considers it unnecessary to explain the principles upon which such *mixtures* should be made, but refers intending competitors to Johnston's "Elements of Agricultural Chemistry and Geology," and to "Suggestions for Experiments in Practical Agriculture," by the same author. The proportions of the several substances which are mixed together must in all cases be stated. Blank tables for reporting the results of the experiments will be had on application at the Society's Hall, under signature of the motto intended to be adopted by the competitors. An Example of these Tables is annexed.

As the object of the Society, in offering these Premiums, is to obtain results which will be as valuable to the science as to the practice of agriculture, they beg it particularly to be understood, that while the number of the experiments will of course be taken into account,

still the preference will be given to those which have been performed with the greatest accuracy. The value of the experiments will be enhanced, if accompanied with an analysis or minute description of the soil on which they are made, and means of proving the purity of the manures which were used.

The quantity by weight and cost of the manures employed, as well as the quantity and quality of the crop produced by each, must be accurately ascertained and reported, with the nature and qualities of the soil, its exposure,—if drained,—and such other particulars and observations as the Reporter may deem deserving of attention.

Competitors must, along with their reports, transmit at least half a pound weight of the soil, collected prior to the commencement of the experiment, and the same quantity of each kind of manure employed. Reports to be lodged on or before the 10th of November 1844, under the conditions on pages 5 and 6. The number of the Premiums to be awarded will be regulated by the value of the papers received.

The Society earnestly requests the attention of landed proprietors to this very important subject, and considers that much good might result by their either instituting experiments themselves, or inducing such of their tenants to do so, as they consider qualified to undertake them.

As it is the intention of the Society to make public the practical result of these experiments, they earnestly solicit from all quarters reports of carefully conducted experiments, however small they may be. Those who have no intention to compete for the Premiums, may yet obtain results which the Society would gladly record in their Transactions.

2. REPORTS ON THE CONTINUED EFFECTS OF SPECIAL MANURES.

The Society, viewing the very great importance of substantiating, by actual observation and experience, the effects which Guano and other Special Manures exert on the soil for a certain number of years after their application, offers a Premium for the best Report on this subject, to be given in 1844, having reference to the experience of two or more preceding seasons. This Premium to be continued in 1845–46. It is intended chiefly for those gentlemen who experimented and reported so successfully for the Premiums offered for Experiments with certain Special Manures in the last year's printed list; but it is open to other Competitors who may have followed the same, or a similar line of inquiry. In all cases, the subsequent produce of the land which had received the

Special Manure will be noted carefully by weight or measure, and compared with an equal portion of land receiving no Special Manure. Tables for reporting the results will be supplied on application at the Society's Hall.

Reports to be lodged on or before 10th November 1844, under the conditions on pages 5 and 6.

3. FEEDING OF STOCK.

It is required to ascertain, by direct experiment, the actual addition of weight to *growing* and to *fattening* stock respectively, by the use of different kinds of food, as well as the exact effect of weighed quantities of food of different kinds, upon the quantity and quality of milk, in full grown milk cows *in calf and not in calf*, and the Society offers a Premium for the best Series of Experiments having this object in view, either in regard to full grown Stock, to fattening Stock, or to Dairy Cows.

The attention of the experimenter will be drawn to the effects of Turnips, Carrot, Beet, Potatoes, or other roots, as well as to that of Beans, Oats, Barley, and Oil Cake, and to the opinion that warmth is equal to a certain amount, or causes a certain saving of food.

Before commencing the comparative experiments, the animals must be fed on equal quantities of the same kinds of food for some weeks previously.

The animals tried against each other should be, as nearly as possible, of the same age, weight, condition, maturity, and purity of breed. Different breeds, indeed, may be compared, and this will form an interesting experiment of itself.

The animals are to be treated, in every respect, alike. The food and drink to be regularly weighed and measured, and samples of the food (when this can be done) carefully analysed. The live and, if killed, the dead weights of the animals, at the close of the experiment, should be ascertained, and the quantity of tallow which they yield.

Reports to be lodged by the 10th of November 1845, under the conditions on pages 5 and 6.

4. RADICAL EXCRETION OF PLANTS.

For an Essay on the Radical Excretion of different Plants, or the various substances discharged from their Roots. It is desirable to examine the subject physiologically as well as chemically, and to ascertain the existence, or otherwise, of a power of excreting various noxious substances previously absorbed, as well as of the supposed

natural excretions. It will also be desirable to contrast, and endeavour to explain, the well-known fact of certain species being crowded together for many centuries, as in native forests, and yet thriving, with the equally well-known fact of the degeneration of other species, as wheat, when cultivated for even a few years upon the same spot. It is not expected that satisfactory observations on this subject can be completed before the autumn of 1845.

NOTE.—Decandolle, Macaire, and others, from various experiments, have been led to suppose that different excretions are discharged from the roots of plants, which may probably account for their effects in deteriorating the soil for the production of the same species. The Essays are expected to give the result of original experiments, determining the fact whether or not such excretions occur; and, if they do, to ascertain the chemical nature of the matter excreted from different plants, more especially the cultivated Gramineæ, Leguminose, and Cruciferæ.

5. ON THE ABSORPTION OF LIQUID SOLUTIONS BY TIMBER, AND THE EFFECTS.

For an Essay or Memoir, describing a series of experiments made by the author to ascertain what are the solutions which, by being absorbed by cut Timber or by living Trees, are best fitted to preserve the wood from decay—to impart to it strength, incombustibility, hardness, colour, elasticity, flexibility, and fragrance, not possessed by it in its natural state, and to diminish its tendency to shrink and warp—The Gold Medal.

In consequence of certain experiments made in France by Dr. Boucherie on living Trees, (a notice of which is contained in the Society's Premium List for 1841,) the Directors were induced to offer in that year a premium for a similar set of experiments in this country. That offer brought forward a valuable and interesting paper. In consequence, however, of the author being under the necessity to lodge his communication with the Society by a certain date, he had not then been able to ascertain in several cases the ultimate effects of the chemical agencies employed by him. The Directors, therefore, think it incumbent on them to repeat the premium for competition in 1844. Essays to be lodged by 20th October in that year. under the conditions on pages 5 and 6.

6. STEEPING SEEDS.

Considerable attention having lately been drawn to the steeping of Seeds, the Society is desirous that the subject should be fully investigated; and it offers the Gold Medal for the best, and the Medium Gold Medal for the second best Report on the Subject.

The steeping of seeds may have for its object, either to promote the immediate and general growth of the seed, in which case the nitrates of potash and soda, or sal ammonia and sulphate of ammonia, chamber ley, or weak gas liquor, would be most likely to be efficacious; or it may be intended to supply some substances which the plant requires, but which the seed does not contain in sufficient quantity.

The Society, therefore, among other substances, would recommend that trials should be made to considerable extent, with mixtures of the nitrates or ammoniacal salts, with substances such as phosphate of soda, sulphate of magnesia, common salt, sulphate of soda, or chloride of calcium, which are capable of supplying those inorganic compounds which the seed naturally contains. The salts may either be mixed together and dissolved in the same quantity of water, or they may be dissolved in separate small portions of water, in each of which the seed may be steeped in succession. The wet seeds may be dried with lime, with gypsum, or with carbonate of magnesia. The proportions of the mixtures to be stated.

It is certain, that the same steeps will not benefit in an equal degree all kinds of grain, or even all varieties of the same kinds of grain. It would be desirable, therefore, to preserve samples of those which are, and of those which are not benefited, with a view to their being afterwards analysed.

The attention of intending Competitors is directed to a communication made to the Society on this subject, by Mr. James Campbell, Dundee, published in the Society's Transactions, p. 155 of No. 3, New Series.

Reports to be lodged by the 10th November 1844, under the conditions on pages 5 and 6.

This Premium may probably be continued for another year.

7. ANALYSIS OF OATS.

Little is yet known of the true composition of oats, either of their organic or of their inorganic parts. The nature of the organic parts, for example, is believed to vary with the kind of soil in which the oat is grown—strong land, light land, and peaty soils, each growing its own peculiar samples from the same seed. The kind of manure and the season cause similar differences, which become more marked still, when different varieties of oats are compared with one another. Again, the inorganic part of the oat varies with the same circumstances of soil, manure, climate, and variety of seed; but it is not known to what extent it varies, either as to quantity or quality.

The Society, therefore, offers a premium of Fifty Sovereigns for

the analytical examination of the grain of oat, by which the greatest number of the above points may be ascertained.

The object of the inquiry is to throw light upon the general value of the oat, and of its different varieties, as a food for man or beast; and upon the mode of culture which in different districts ought to be adopted, in order to raise this or that quality or variety.

Reports, containing the mode and the details of the analysis, to be lodged on or before the 20th of October 1845, under the conditions on pages 5 and 6.

8. DISEASE IN POTATOES.

The Potato Crop, which is of such importance in this country, having become very generally infected with disease, the Society is desirous, if possible, of ascertaining whether or not by the aid of chemical analysis, any light can be thrown upon the cause of the disease, and upon the remedy to be applied.

A premium of Fifty Sovereigns is therefore offered for the best and approved analysis of sound and unsound Potatoes, and of the soils on which they grew. The analysis of the several varieties of Potato, to embrace both their organic and inorganic constituents. The details of the experimental researches, which will include Potatoes both at taking up and at seed-time, and the method of analysis adopted, to be given in the Essay, which is to be lodged on or before the 20th October 1846, under the conditions on pages 5 and 6.

9. FEEDING OF FARM HORSES.

Twenty Sovereigns, or a Piece of Plate of that value, will be given for the best and approved account of an experiment or experiments, showing the most economical mode of maintaining Farm Horses, consistently with the health of the animals, and their fitness for the general work of the Farm.

Competitors will be required to furnish a detailed statement of the kinds, quantities, and value of the food consumed for the six months preceding the term of Whitsunday, distinguishing what proportion, if any, has been prepared by boiling, steaming, or bruising: And also, whether the whole or any part of the fodder was chopped or cut, and what saving, if any, is effected by that operation, under deduction of the expense of performing it.

Reports, showing to what extent preparing food, by all or any of the preceding modes, is advantageous in an economical point of view, will be deemed valuable.

The attention of Competitors is requested to a Report on this subject, for which the Society's Premium of Twenty Sovereigns was awarded

in 1841, to Mr. Cowie, Mains of Haulkerton, published in the Number of the Society's Transactions for March 1842, and to a paper by Mr. Stevenson, Redside, in the Fourth Number of the Transactions, New Series.

Reports to be lodged by the 20th October 1844, under the conditions on pages 5 and 6.

10. SHEEP WASHING.

For an approved Essay or Report, suggesting specific improvements in the mode of Washing Sheep, and the means of introducing such improvements into the practice of Scotland—The Gold Medal.

NOTE.—The present system of sheep-washing generally, as practised in Scotland, is admitted to be defective in almost all essential requisites. It is thought improved modes may easily be devised and carried into practice, and it is hoped the attention of practical sheep farmers will be directed to the subject by the offer of the present premium.

Essays or Reports to be lodged on or before 20th October 1844, under the conditions on pages 5 and 6.

11. ON MIXING OF SOILS.

The Gold Medal, or Plate of the same value, will be given for a Report of experiments on mixing of Soils, detailing the results of them ; and, in particular, on the application of clay or till to light soils, to render them more tenacious, and bring them into a loam. The application of sand to clay soils, to render them more open and pervious to air, water, and to the roots of plants. The application of sand, gravel, till, or clay, to mossy soil ; and also on the application of bog earth, or moss, to various soils, and the manner of preparing and applying it. It will be necessary to give the quantities required for the various soils, an account of the expense, and an estimate of the increased value of the land per acre. Specimens of the soils, both before and after the experiments, to be sent with the Report.

Reports to be lodged on or before the 20th October 1844, under the conditions on pages 5 and 6.

12. SAVING OF LIQUID MANURE.

The Gold Medal, or Plate of the same value, will be given for the best and approved Report, founded on practical experience, on the most efficient and economical mode of collecting and applying Liquid Manure, adapted to cottages and farm houses, as well as to farm yards and offices. Cleanliness in the arrangements for cottages to be attended to.

Reports to be lodged on or before the 20th October 1844, under the conditions on pages 5 and 6.

13. ON THE INFLUENCE OF GEOLOGICAL FORMATIONS UPON THE GROWTH OF CROPS OR TREES IN SCOTLAND.

For an approved Essay or Report, pointing out the Agricultural Crops, or the kinds of Forest Trees which thrive best on any of the various geological formations of Scotland, and explaining the reason why certain crops or kinds of Forest Trees thrive better on some formations than on others—The Gold Medal.

NOTE.—The Reporter to state the altitude above and the distance from the sea. It will be of importance also to state whether the effects produced appear to depend on the chemical composition of the rocks, or on the mechanical structure of the soils upon which the crops or trees reported on grew.

Essays or Reports to be lodged on or before the 20th October 1844, under the conditions on pages 5 and 6.

14. ON THE IMPROVEMENT OF EXISTING COTTAGES.

The Medium Gold Medal will be given for the best and approved Essay or Report on the most efficient means, at the least expense to the owners, of improving and enlarging, where necessary, the existing Cottages of the labouring classes throughout Scotland, having regard to the rendering them, in every part of the country, more comfortable and commodious, with sufficient room for a family, either by different arrangements, by the conversion of three houses, when too small, into two, or by additions internal or external.

Essays to be lodged on or before 20th October 1844, under the conditions on pages 5 and 6.

15. ON RAISING IMPROVED VARIETIES OF AGRICULTURAL PLANTS.

For an approved Report, founded on actual experiment, detailing the means which may have been successfully employed by the Reporter for obtaining new and superior varieties, or improved sub-varieties, of the different cultivated Grains and Grasses, Clovers, Beans, Peas, Turnips, Potatoes, or other Agricultural Plants, either by minute attention to the selection of the Seed, by hybridation, or such other means as may have been found efficacious—The Gold Medal, or Plate of the same value.

It is necessary that the varieties and subvarieties reported upon shall have been proved capable of reproduction from seed, and also that the relation they bear to others, or well known sorts, shall be stated. The Reporter is farther requested to mention the effects that he may have observed in different soils, manures, &c., to produce on the plants forming the subjects of Report, and how far he may have ascertained such effects to be lasting.

NOTE.—Should any improved variety reported upon be the result of direct experiment

by cross impregnation, involving considerable expense and long-continued attention, a higher Premium will be awarded.

Reports to be lodged on or before the 20th of October 1845, under the conditions on pages 5 and 6.

16. ON THE CULTIVATION OF RED CLOVER.

For an approved Report on the best mode of managing Lands which have become sick or tired (as it is termed) of common Red Clover, *Trifolium pratense*, so as to restore their capability of properly yielding that crop for hay, &c., without altering the generally practised system of rotation—The Gold Medal, or Ten Sovereigns.

Reports to be lodged on or before the 20th of October 1845, under the conditions on pages 5 and 6.

17. INFLUENCE OF PLANTS ON DAIRY PRODUCE.

For an approved Essay or Report on the Influence of Plants taken as Food, on the taste, flavour, or quality of Milk, Butter, Cheese, or other Dairy produce—Ten Sovereigns, or Plate of that value.

NOTE.—It has been long known that the milk produced from particular pastures during certain months is deteriorated, and that the Butter and Cheese made from it are imperfect in flavour and in quality, so as sometimes to be unfit for use. This effect is supposed to arise from certain plants growing (and during these months flourishing) in the pastures; and it is to ascertain these, and their effects, that the above premuim is offered. It is desired that the effects on the Milk, &c., from the eating of such supposed noxious plants, shall be stated from experiment; and that dried specimens of the plants shall accompany the Essay. The particular seasons or months such plants are in their highest vigour should also be mentioned, and the best manner of extirpating them.

Essays or Reports to be lodged on or before the 20th October 1845, under the conditions on pages 5 and 6.

18. REPORTS ON IRRIGATION.

The Gold Medal, or a Piece of Plate of the same value, will be given for the most approved account of the management of Water Meadows, founded on actual experiment within three years preceding the date of the Essay.

The experiments must be made on not less than five acres, whether detached or otherwise, and a description to be given of the rills or streams employed, and of the quality of the water, and of the manner of collecting and applying it, also an account of the land prior to the introduction of irrigation upon it, and of its estimated value at that period, and at the time when the Report is made; certified statements to be furnished of the quality of grass, if any, cut green in

the spring, and the quantity and quality of the hay and aftermath produced upon the portion reported on, and the kind of stock, if any, which has been allowed to depasture it.

The Essays, accompanied by a specimen of the hay produced that season, to be lodged on or before the 20th October 1845, under the conditions on pages 5 and 6.

19. EXPERIMENTS IN DEEP PLOUGHING.

In order to obtain information on the results of subsoil ploughing, trench-ploughing, or any other mode of deep ploughing on thorough-drained land, or on land that does not require draining, with the comparative merits of the different modes on the same soil, the Society offers an annual Premium of the Gold Medal for the best and most satisfactory account of experiments made on not less than four acres of land of as nearly as possible the same quality and description—stating the description of soil, and the subsoil upon which it rests—in each of the methods of ploughing, one-half of which shall have been deep ploughed, and the other half cultivated in the ordinary way. The whole extent of ground to be under the same description of crop, and in other respects both portions to be cultivated and managed alike. The quantity and quality of the produce of each portion to be stated; the depth reached by the plough to be noticed, with such other observations as the experimenters may deem deserving of attention.

Besides the principal Premium for the year, the Society proposes to give Honorary Premiums for such reports as shall be deserving of distinction.

Reports to be lodged on or before the 20th October, in any year, under the conditions on pages 5 and 6.

20. VEGETABLE PRODUCTIONS OF INDIA AND CHINA.

The Gold Medal will be given for the best and approved Report on the hardy, or supposed hardy, useful Plants and trees of China, with those of the Himalaya, and other alpine parts of India, where such climate exists as to induce the belief that they may be beneficially introduced into the cultivation of Scotland.

There being reason to believe that, in addition to the useful vegetable productions which have of late years been introduced from Upper India, such as the *Cedrus Deodara*, *Pinus excelsa*, *Abies Smithiana*, &c., many others may exist in the same regions, and in China, equally well suited to this climate, the Society has been induced to offer the

above Premium, with a view towards obtaining the fullest information relative both to the unintroduced sorts and those already known in this country, for the purpose of encouraging the introduction of the former, as well as the more extended culture of the latter. Reporters are, therefore, required to give the generic and specific names, with the authority for the same—together with the native names, in so far as known; also to state the elevation and nature of the locality and soil in which they are cultivated, or which they naturally inhabit, with their qualities or uses; and it is farther requested that the descriptions be accompanied, in so far as possible, with specimens of the plants and their fruit, seed, timber, or other products.

The transmission of living plants in boxes, or in cases covered with glass, may be attempted where practicable; the external air should be excluded, and almost no water given during the voyage. Where this plan is adopted, smaller seeds, berries, or heps, may be thickly mixed with the soil or earth in which the plants are placed. Seeds may be sent home in the cones, wrapped in brown paper, packed in a box, to be kept in a cool airy part of the cabin, but on no account in the hold, nor in close tin cases.

In the event of the seeds of Coniferæ being separated from the cones, with the view of lessening the bulk and weight of packages intended for overland carriage, hasty and severe heating should be carefully avoided in extracting the seeds.

Reports to be lodged by the 20th October in any year.

21. REPORTS ON IMPROVED RURAL ECONOMY ABROAD.

The Honorary Gold or Silver Medal of the Society, according to the value of the communication, will be given for approved accounts, founded on personal observation, of any useful practice or practices in Rural or Domestic Economy, adopted in other countries, which may seem fitted for being introduced with advantage into Great Britain.

The purpose chiefly contemplated by the offer of the present Premium, is to induce gentlemen who may visit other countries to take notice of and record such particular practices as may seem calculated to benefit their own country in the branches of the arts referred to, and it is proposed that the earliest opportunity shall, in all cases, be taken of communicating such details to the public.

Reports to be lodged by the 20th October in any year.

CONDITIONS OF COMPETITION FOR ESSAYS AND REPORTS.

The General Conditions of Competition for Essays and Reports will be found under

the "Notice to Candidates," on pages 5 and 6, to which Competitors are particularly referred.

ROCKS, MINES, AND MINERALS.

This section of the Premiums has this year been suspended, there being in hand a considerable accumulation of unpublished Surveys and Reports.

CLASS II.

AGRICULTURAL MACHINERY.

INVENTION OR IMPROVEMENT OF IMPLEMENTS OF HUSBANDRY.

To the person who shall invent or improve any Instrument or Machine applicable to Husbandry or Rural Economy (other than those above specified,) which, from its utility in saving labour or expense, simplicity, or cheapness of construction, or other circumstances, shall be deemed by the Society deserving of public notice.—The Gold or the Silver Medal, or such sum in money as the communication shall appear to deserve.

The account of the implement must be accompanied by a Model, made to a scale of three inches to the foot, to be deposited in the Society's Museum. The model to be formed of wood or metal; and the notice or description transmitted with it must specify, according to the best of the inventor's abilities, the purpose or advantage of his invention or improvement. When machines or models are transmitted, it must be stated whether they have been elsewhere exhibited or described. Models and descriptions may be lodged at any time with the Secretary.

CLASS III.

WASTE LANDS.

1. IMPROVEMENT OF A SPECIFIED EXTENT OF WASTE LAND BY TILLAGE.

To the Proprietor or Tenant in Scotland who shall, on or before the 20th of October in any year, transmit to the Society the most satisfactory Report of having successfully improved, and brought into profitable tillage, within a period of five years immediately preceding the date of his communication, an extent of waste and hitherto uncultivated Land, not being less than one hundred acres—The Gold Medal.

To the Tenant in Scotland who shall, on or before the 20th Octo-

ber in any year, transmit to the Society a satisfactory Report of having, within the period of three years preceding the date of his Report, successfully improved, and brought into profitable tillage, an extent of waste and hitherto uncultivated Land, not being less than thirty acres on the same farm—The Honorary Silver Medal.

The Reports in competition for both premiums may comprehend such general observations on the Improvement of Waste Lands, as the writer's experience may have led him to make; but they are required to refer especially to the land reclaimed, (which, if not in one continuous tract, must be in fields of considerable extent,) to the nature of the soil, the previous state and probable value of the ground, the obstacles opposed to its improvement, the mode of management adopted, the expense, and, in so far as can be ascertained, the produce and value of the subsequent crops; and the land must have borne one crop of grain, at least, previous to the year in which the Report is made. The Reports must be accompanied by a detailed statement of the expense, and by a certified measurement of the ground. Competitors for the more limited extent improved will observe, that, having gained the Silver Medal, it shall not afterwards be competent to include the same improvement in a subsequent claim for the Gold Medal. Competitors for both Premiums will attend to the general conditions which will be found on pages 5 and 6.

2. IMPROVEMENT OF MUIR OR MOSS GROUND BY TOP-DRESSING.

To the proprietor or tenant in Scotland who shall, on or before the 20th of October in any year, transmit to the Society the most satisfactory Report of having successfully improved the pasturage of not less than fifty acres of Muir or Moss Lands, by means of Top-Dressing without Tillage—The Gold Medal.

The Society has been given to understand, as the result of actual experiment, that a great extent of muir and moss land in Scotland may be converted into, comparatively speaking, superior pasturage by top-dressing without tillage; and it is, therefore, desirous of encouraging, and also receiving reports of such experiments. Reports must state the particular mode of top-dressing adopted, and the expense per acre, and as many particulars as possible regarding the previous natural products of the soil, the elevation of the ground, and the changes produced by the application of the top-dressing, and also whether and to what extent, the lands had been at the same time, or previously, drained.

CLASS IV.

CROPS AND CULTURE.

1. NEW PLANTS ADAPTED TO FIELD CULTURE.

To the person who shall, on or before the 20th October, in any year, report to the Society any new species or variety of useful Plant adapted to the ordinary field-culture of Scotland—The Gold or Silver Medal, or a Piece of Plate, as the Directors may see fit in the circumstances of the case.

Attention is directed to the raising or procuring of new varieties of cereal grains and leguminous plants, as well as of the more useful herbage and forage plants, and particularly of a nutritious and succulent vegetable for Spring food for Ewes, to preserve them in Milk in seasons when Grass is late, and Turnips have lost their properties for that object.

Specimens of the Grains and Plants to be transmitted, if this can conveniently be done.

2. SEED FOR CORN AND OTHER CROPS.

The Society, with the view of aiding Local Associations and Individuals in the improvement of the different varieties of Grain, &c., best adapted for their respective localities, offers for each of the years 1844, 1845, and 1846, in six several Districts, the Society's Silver Medal to the Grower of the best of each of the following Seeds raised in the District in which the Competition is held.

1. For the best and approved parcel of any named variety of White Seed Wheat.

2. For the best and approved parcel of Red Seed Wheat.

3. For the best and approved parcel of Chevalier Barley.

4. For the best and approved parcel of any other named variety of Seed Barley.

5. For the best and approved parcel of Potato Oats.

6. For the best and approved parcel of Hopetoun Oats.

7. For the best and approved parcel of any other named variety of Early Seed Oats.

8. For the best and approved parcel of any named variety of late Seed Oats.

9. For the best and approved parcel of any named variety of Field Bean.

10. For the best and approved parcel of any named variety of Early Field Peas.

11. For the best and approved parcel of any named variety of late Field Peas.

12. For the best and approved parcel of Common Tares or Vetches.

13. For the best and approved parcel of perennial Rye Grass Seed.

14. For the best and approved parcel of Timothy Grass Seed.

15. For the best and approved parcel of any variety of Potato.

CONDITIONS.

1. The Local Associations and individuals intending to institute competitions for any of the above medals, to lodge with the Secretary of the Society a statement of the different descriptions of seeds intended to be competed for, with a satisfactory guarantee that Money Premiums shall be given to the extent of not less than L.2 sterling, for each variety of such seeds.

2. In each District, a Convener, to be appointed by the Society, with the aid of the other Members of the Society in the District, and of the Local Association or Individual contributing the Money Premiums, will fix the time and place of Competition, appoint the Judges, and make all other necessary arrangements.

3. The quantity shown in Competition by each grower must not be less than three quarters of each variety of grain, two quarters of Beans, Peas, Vetches, and Grass Seeds, and half a ton of Potatoes.

4. The Judges shall be guided in their awards—1st, By the purity of the Seed;—2d, By its freeness from extraneous Seeds;—and, 3d, Where there is an equality in these respects, by the weight.

5. The successful Competitors must, immediately after their preference is declared, transmit to Mr. Gorrie, Assistant to the Curator of the Society's Museum, free of expense, a sample of each of the prize seeds, &c.; and the awards of the Judges must be reported by the Convener to the Society within eight days after the Competition. Where the Seed consists of Grain, the quantity transmitted not to be less than half a gallon. It is desirable that the produce per imperial acre should be stated, as far as can be ascertained, as well as the altitude, exposure, and nature of the soil, on which the crops were raised, together with the dates of sowing and reaping.

Applications have been received, and sustained for the present year, for,

First District—Fettercairn: The Premiums to be to the growers of,

1. The best and approved parcel of English Barley.
2. The best and approved parcel of Potato Oats.

Second,—Lower District of Annandale: The Premiums to be to the growers of,

1. The best and approved parcel of Red Seed Wheat.
2. The best and approved parcel of Potato Oats.
3. The best and approved parcel of Perennial Rye Grass Seed.
4. The best and approved parcel of any variety of Potato.

Third District—East-Lothian: The Premiums to be to the growers of,

1. The best and approved parcel of any named variety of White Seed Wheat.

2. The best and approved parcel of Red Seed Wheat.

3. The best and approved parcel of Chevalier Barley.

4. The best and approved parcel of Hopetoun Oats.

5. The best and approved parcel of any other named variety of Early Seed Oats.

6. The best and approved parcel of any named variety of Field Beans.

7. The best and approved parcel of any named variety of early Field Peas.

8. The best and approved parcel of common Tares or Vetches.

9. The best and approved parcel of perennial Rye Grass Seed.

10. The best and approved parcel of any variety of Potato.

Fourth District—The County of Nairn: The Premiums to be to the growers of,

1. The best and approved parcel of any named variety of White Seed Wheat.

2. The best and approved parcel of any named variety of Seed Barley.

3. The best and approved parcel of any named variety of Early Seed Oats.

4. The best and approved parcel of any named variety of late Seed Oats.

5. The best and approved parcel of perennial Rye Grass Seed.

Fifth District—Dalkeith: The Premiums to be to the growers of,

1. The best and approved parcel of any named variety of White Seed Wheat.

2. The best and approved parcel of Red Seed Wheat.

3. The best and approved parcel of Chevalier Barley.

4. The best and approved parcel of any other named variety of Seed Barley.

5. The best and approved parcel of Potato Oats.

6. The best and approved parcel of Hopetoun Oats.

7. The best and approved parcel of any other named variety of Early Seed Oats.

8. The best and approved parcel of any named variety of late Seed Oats.

9. The best and approved parcel of any variety of Potato.

SIXTH DISTRICT of BUCHAN: Premium for,

Any named variety of Early Seed Oat.

FIRST DISTRICT—Convener, Sir John Stuart Forbes, Bart. of Fettercairn.

SECOND DISTRICT—Convener, Colonel Graham of Mossknow.

THIRD DISTRICT—Convener, Sir George Grant Suttie, Bart. of Preston-grange.

FOURTH DISTRICT—Convener, William Mackintosh, Esq. of Geddes.

FIFTH DISTRICT—Convener, Robert Scott Moncrieff, Esq.

SIXTH DISTRICT—Convener, Robert Hutchison, Esq. of Cairngall.

The premiums in these districts will be awarded under the general conditions above mentioned.

Applications from any of the above districts which may desire to have the premiums continued for another year, or from other districts which have not already had the Premiums, to be lodged with the Secretary of the Society by 20th October next. The Directors will select from the applications the six Districts for 1845.

3. TURNIP SEED.

1ST, SWEDISH TURNIP.—The Society's Gold Medal, or Ten Sovereigns, will be awarded in 1844 to the person in the districts of EAST, WEST, or MID-LOTHIAN, who shall have grown, in that year, a quantity of not less than ten quarters of the most approved quality of seed of any variety of yellow-fleshed Swedish Turnip, either from the best and purest approved stock of mature selected and transplanted bulbs, or from the seed of turnips which shall have been so selected and transplanted.

2D,—The Society's Gold Medal, or Ten Sovereigns, will be awarded in 1845 to the person in the County of AYR, who shall have grown, in that year, a quantity of not less than ten quarters of the most approved quality of seed of any variety of yellow-fleshed Swedish Turnip, either from the best and purest approved stock of mature selected and transplanted bulbs, or from the seed of turnips which shall have been so selected and transplanted.

N.B.—This Premium will be repeated in 1846, in Berwick and Roxburgh shires.

3D, YELLOW FIELD TURNIP.—The Society's Gold Medal, or Ten Sovereigns, will be awarded in 1845 to the person in the district of ORKNEY, who shall, in that year, have grown a quantity of not less than ten quarters of the most approved quality of seed of any variety of yellow Field Turnip, (Swedes excepted,) from the best and

purest approved stock of mature selected and transplanted bulbs, or from the seed of turnips which shall have been so selected and transplanted.

N.B.—This Premium will be repeated in 1846, in Aberdeen and Kincardine shires.

Considerable disappointment and loss having been experienced of late years by turnip growers in certain districts, from inattention to the proper selection and management of seed crops, and their isolation from other similar crops, the Society offers the above Premiums with the view of directing attention to, and encouraging the more careful growth of turnip seeds from selected and transplanted stocks.

Competitors for 1844 must have lodged intimation of their intention with the Secretary of the Society, on or before the 1st of December last; and competitors for 1845 must make similar intimation on or before the 1st of December next; so as to admit of an inspection of the growing crops being made by judges appointed by the Society, who will be guided in their awards,

1st, By the purity of the stock.

2d, By the symmetry of the form.

3d, By the apparent hardiness of the variety.

4th, By its apparent capability of yielding a bulky or heavy crop; and

5th, By the quality of the seed raised.

Competitors in 1844, are required to lodge, on or before the 10th November next, and those in 1845, on or before the 10th of November in that year, a properly certified statement of the extent of ground they had under crop, and the quantity of clean marketable seed harvested; accompanied with a fair sample of not less than one peck, and twenty roots of each variety of the turnip, as specimens, to be delivered free at the Society's Museum, George IV. Bridge, Edinburgh.

NOTE.—It has been observed by Mr. Cobbold (a distinguished agriculturist of Suffolk, and one of the earliest cultivators of the Swedish Turnip in that district) that, in Scotland, sufficient attention is not generally paid to the selection of the best varieties of Swedes for the production of seed; that those plants having long stalk-like tops, and coarse fibrous-rooted or discoloured bulbs, should be rejected; and those alone employed which have very short tops, and clean smooth bulbs, with only a small tap-root; and that they should be grown completely apart, and at as great a distance as possible from all similar crops. In Suffolk, Mr. Cobbold mentions, the transplanted bulbs are generally placed in rows two feet and a half apart, but the turnips in the row are set so closely together, that they almost touch each other.

Nearly the same observations are applicable to the want of attention, in too many instances, in the selection of Yellow Turnips, from which seed is intended to be raised.

4. PLOUGHING COMPETITIONS.

Premiums to ploughmen for improvement in Ploughing having for some years been given very generally over the country by the resident Gentlemen and Local Farming Societies, the Highland and Agricultural Society has, in the mean time, discontinued its money prizes; but, being desirous of encouraging improvement in this branch of husbandry, the Society will give its Silver Plough Medal to the Ploughman found to be the best at such competitions, provided not fewer than fifteen Ploughs shall have started, and that Premiums in money to an amount not less than Three Sovereigns shall have been awarded. It shall be imperative on the Judges of the competition, in deciding on the merits of the competitors, to take into consideration the time occupied in ploughing the ground assigned to them respectively; and in all cases to give the Society's Medal to the competitor found entitled to the first money premium in addition to it. The Medal will be issued upon a report from one or more Members of the Society, who shall have actually attended the competition. This Report must state,

1. The date and place of Competition.
2. That the Member who signs the Report was present at the Competition.
3. The number of Ploughs which competed.
4. The number and amount of the money premiums awarded.
5. The names of the Ploughmen to whom the premiums were awarded; and, if servants, in whose employment they are; the estimated quantity of ground assigned for ploughing; the time occupied by the Competitors respectively in ploughing it; and the sum voted to each.

The Report must be lodged with the Secretary, at the Society's Hall, within three months from the date of the Competition, and must state the above particulars, otherwise the Medal will not be issued.

NOTE.—The Society has been induced to make the stipulation as to *time* forming an element in the merits of Competitors, from having observed the bad effects of omitting it in some Competitions, by which the Ploughmen were led in some measure to underrate the importance of time in ploughing, as well as in all other farming operations; and the Society would suggest for the consideration of the resident Gentlemen and Local Societies, that on land of average tenacity the rate of Ploughing should not be less than will turn over an imperial acre in ten hours.

CLASS V.

LIVE STOCK—DISTRICT COMPETITIONS.

§ I. CATTLE.

PREMIUMS FOR IMPROVING THE BREED OF CATTLE IN THE FOLLOWING DISTRICTS.

1. *The County of Renfrew.*
2. *The District of Auchtermuchty, Fifeshire, comprehending the Parishes of Auchtermuchty, Falkland, Strathmiglo, Newburgh, Abdie, those parts of the Parishes of Arngask and Abernethy, in the County of Fife, and those parts of the Parishes of Collessie and Kettle lying to the westward of the Turnpike Road leading from New Inn by Trafalgar to Newburgh.*
3. *The Counties of Stirling and Clackmannan, and that part of the County of Perth which is under the jurisdiction of the Sheriff-Substitute of the Dumblane District.*
4. *The County of Caithness.*
5. *The County of Dumbarton, excepting the detached Parishes of Cumbernauld and Kirkintulloch, and also that portion of the County of Renfrew situated on the right bank of the River Clyde.*
6. *The District of Lorn, Argyllshire, comprehending the country from Kilmelford to Lochaw, by Lochavich, and the Water of Avich; from thence by Lochaw to the Water of Tettle, including the country of Glenorchy to the head of Lochleven; and from thence to Linealich by the Sound of Corryvreckan to Lochmelford.*
7. *The Parishes of Tullynessle and Forbes, Keig, Leslie, Alford, Touch, Monymusk, Kenmay, and Cluny.*
8. *The Parishes of Banchory-Ternan, Strachan, Glentanner, Birse, Kincardine-O'Neil, Echt, Peterculter, Drumoak, Durris, Maryculter, Lumphanan, and Midmar, in the Counties of Aberdeen and Kincardine.*

9. *The Parishes of Cargill, Collace, Kinclaven, Cupar-Angus, Bendochy, Blairgowrie, Alyth, Ruthven, Airlie, Glammis, Essay, Nevay, Meigle, Newtyle, Kettins, and Caputh, in the Counties of Perth and Forfar.*
10. *The Parishes of Maybole, Kirkmichael, Straiton, Dailly, and Kirkoswald, in the County of Ayr.*
11. *The County of Sutherland.*
12. *The County of Banff, excepting the Parishes of Inveravon, Kirkmichael, Mortlach, and Aberlour, and those parts of Banffshire in the Turriff District.*
13. *The Parishes of Strathdon, Glenbucket, Auchindoir, Kildrummy, Loechel-Cushney, Towie, Tarland, Migrie, Aboyne, Logie Coldstone, Coul, those parts of the Parish of Tullich in Cromar, and those parts of the Parishes of Glenmuick, Glengairn, and Tullich, and of Crathie, which are on Gardenside, and in Morven.*
14. *The Parishes of Auchterarder, Blackford, Muthill, Comrie, Monzievaird and Strowan, Crieff, Monzie, Fowlis Wester, Madderty, and Trinity Gask, in the County of Perth.*

Class I.

1. For the best Bull, above two and under eight years old, to be exhibited at the Competition in each of the four Districts, Nos. 6, 7, 11, and 13, as above described, *bona fide* the property of a Proprietor, Factor, or Tenant, and kept in his possession from the 20th day of May preceding the Competition — The Honorary Silver Medal.

2. For the best Bull, above two and under eight years old, *bona fide* the property and in possession of any Tenant in each of the said four Districts, Nos. 6, 7, 11, and 13, kept on his farm within the District, from the 20th day of May preceding the Competition — Ten Sovereigns.

3. For the second best Bull, of the same age, in each of the said four Districts, the property, and in the possession, of any Tenant, and kept on his farm, within the District, for the aforesaid period — Five Sovereigns.

Class II.

1. For the best Bull, above two and under eight years old, *bona fide* the property, and in possession of any Proprietor or Tenant, in *each* of the ten Districts, Nos. 1, 2, 3, 4, 5, 8, 9, 10, 12, and 14, as above described, kept on his farm, within the District, from the 20th day of May preceding the Competition—Ten Sovereigns.

2. For the second best Bull, of the age above specified, *bona fide* the property, and in possession of any Proprietor or Tenant, in *each* of the said ten Districts, and kept on his farm within the District for the aforesaid period—Five Sovereigns.

Class III.

1. For the best two Queys of two years old, the property of, and bred by, any Tenant in *each* of the said Districts, Nos. 1, to 14, inclusive — Five Sovereigns.

2. For the second best two Queys of two years old, the property of, and bred by, any Tenant in each of the said fourteen Districts — Three Sovereigns.

The Competition in the Districts, Nos. 1 to 7, both inclusive, will take place in 1844, and in Nos. 8 to 14, both inclusive, it will take place in 1845.

For the First District—John Maxwell, Esq. younger of Pollock; in his absence, William Maxwell Alexander, Esq. of Southbar, to be Convener of the Society's resident Members; five to be a quorum of the Committee.

For the Second District — O. T. Bruce, Esq. of Falkland, to be Convener of the Society's resident Members; three to be a quorum of the Committee.

For the Third District — William R. Ramsay, Esq. of Barnton, M.P., and William Murray, Esq. of Polmaise, or either of them, to be Convener of the Society's resident Members; three to be a quorum of the Committee.

For the Fourth District—Sir George Dunbar of Hempriggs, Bart.; in his absence, James Sinclair, Esq. of Forss, and Robert Innes, Esq. of Thrumster, to be Conveners of the Society's resident Members; three to be a quorum of the Committee.

For the Fifth District—The Duke of Montrose; in his Grace's absence, Alexander Smollett, Esq. of Bonhill, M.P., to be Convener of the Society's resident Members; three to be a quorum of the Committee.

For the Sixth District—The Marquis of Breadalbane; in his Lordship's absence, Dugald Macdougall, Esq. of Gallanach, to be Convener of the Society's resident Members; three to be a quorum.

For the Seventh District—Lord Forbes and Robert Grant, Esq. of Tilliefour, or either of them, to be Convener of the Society's resident Members; three to be a quorum of the Committee.

For the Eighth District—Sir Thomas Burnett of Leys, Bart., and William Innes, Esq. of Raemoir, or either of them, to be Convener of the Society's resident Members; four to be a quorum of the Committee.

For the Ninth District—Sir J. Muir Mackenzie of Delvine, Bart.; in his absence, Mr. Watson of Keillor, to be Convener of the Society's resident Members; five to be a quorum of the Committee.

For the Tenth District—Sir Charles Dalrymple Fergusson, Bart.; in his absence, James Campbell, Esq. of Craigie, to be Convener of the Society's resident Members; five to be a quorum of the Committee.

For the Eleventh District—His Grace the Duke of Sutherland; in his Grace's absence, George Gunn, Esq. Rhives, to be Convener of the Society's resident Members; three to be a quorum of the Committee.

For the Twelfth District—Right Hon. the Earl of Seafield; in his Lordship's absence, Colonel Gordon of Park; in absence of both, John Fraser, Esq. Cullen House, to be Convener of the Society's resident Members; five to be a quorum of the Committee.

For the Thirteenth District—Right Hon. the Earl of Aboyne, and Alexander Leith, Esq. yr. of Freefield; in their absence, the Rev. Robert Meiklejohn, Strathdon, and Andrew Robertson, Esq. Tarland, to be Conveners of the Society's resident Members; five to be a quorum of the Committee.

For the Fourteenth District—The Right Hon. Viscount Strathallan; in his Lordship's absence, John Stewart Hepburn, Esq. of Colquhalzie, to be Convener of the Society's resident Members; three to be a quorum of the Committee.

RULES OF COMPETITION.

1. The Members of the Society resident in, or connected by property with, the respective Districts, are hereby appointed Committees of Superintendence for regulating the Competitions in their several Districts.

2. With the view of putting preparatory arrangements in train for the Competition, the Convener or Conveners of each District in which the Premiums are this year in competition, will summon by circular letters, or in such other manner as they may think expedient and equally effectual, a Meeting of the Society's Members connected with the Districts, to be held at such time and place as the Convener may appoint, not being later than the 20th of May, for the purpose of fixing the time of competition (and also the place of competition, when not already fixed,) and of naming a Sub-Committee for making all necessary preparatory arrangements for the Show,—including the nomination of Judges, if they propose to call practical judges to their assistance; and of giving due intimation, as after directed, of the time and place of Competition.

3. The Meetings of the Committee of Superintendence, and attendance at competitions for Premiums, to be open to all Members of the Society; and not fewer than the prescribed quorum of the Committee to be present.

4. The Conveners, with the approbation of a quorum of the Committees for conducting the several competitions, are respectively authorised, in such cases as they shall see proper, to divide the two Premiums allowed for Bulls into three Premiums, in such proportions as they shall approve,—the first Premium not being less than Eight Sovereigns; and, in like manner, to divide the sums allowed for Queys into three Premiums, fixing their amount.

5. The Committee shall not place for Competition any Stock which, in their opinion, does not fall within the regulations prescribed, or does not possess merit; and in no instance shall any of the Money Premiums be awarded where there are not, after such selection, at least three Competitors. The Committee are, however, authorised, in any case of deficiency in the required number of Competitors, to make such allowance to a party showing stock of merit, not exceeding half the amount of the Premium, as, under the circumstances, they may think reasonable.

6. The times and also the places of Competition are to be fixed by the Conveners, with the advice of at least a quorum of their respective Committees, except in the 13th District, in which Strathdon and Tarland alternately are fixed, and in the 6th District, in which Oban is fixed. The Competitions for the Society's and for the District Premiums are to take place between the 1st of June and 1st of November next.

7. The Conveners will be particularly careful, that the times and places of Competition, are intimated throughout their several Districts, two weeks, at least, previously to the days appointed for the Competitions, in such manner as the respective Local Committees shall deem most effectual for communicating the information to all persons interested; and the modes of intimation which may be adopted in the different Districts, as well as the periods of announcement, must be stated in the Reports of the Competitions.

8. As these Premiums were given, in some of the above-mentioned Districts, in 1839, 1840, 1841, 1842, and 1843, it is to be observed that the Society does not admit an animal, in any Class of Stock, which may have gained the Society's first Premium at a District or General Show in a former year, to be again shown in Competition in any District; and for no description of Stock shall either the same or a lower denomination of Premium be awarded, in the District in which it has already gained a Premium. In those Districts where the Honorary Silver Medal is offered for Bulls, Tenants cannot compete with the same animal, both for the Honorary and the Money Premiums.

9. No Member of the Committee showing Stock of his own at the Competition shall act as a judge; nor shall Factors, when they are Members of the Society, and are named on the Committee, or when acting in the absence of Proprietors, be entitled to compete for the Money Premiums in those districts and classes in which Proprietors are excluded from Competition. It is recommended to the Committee to take the assistance of practical men as judges in awarding the Premiums. In all cases, the Bulls for which the Money Premiums are awarded, must have served, or shall be kept to serve, in the District,

at least one season, and the rate of service may be fixed by the Committee. The same person is not to obtain more than one of the Premiums for Bulls, and one of the Premiums for Queys, in one year, except in a District where Tenants compete for the Honorary and Money Premiums for Bulls, in which case he may, with different animals, carry the Medal and one of the Money Premiums for Bulls, besides a Premium for Queys. While the Directors have deemed it expedient to exclude Proprietors and Factors named on the Committee, or acting in the absence of Proprietors, from competing for the *Money Premiums* in certain Districts, where it is apprehended that the superiority of their Stock might discourage competition on the part of the Tenantry, they are fully impressed with the advantages of having such Stock exhibited at the District Shows, and have offered the Honorary Silver Medal of the Society for the best Bull exhibited at the Competition, whether the property of one of the parties aforesaid, or of a Tenant, if superior to the Bull to which the highest Money Premium is awarded. A Bull which, as the property of a Proprietor, a Factor, or a Tenant, may have gained the Honorary Medal, will be allowed to compete, in a future year, for the Money Premiums, when, *bona fide*, the property, and in the possession of a Tenant who shall not have been the gainer of the Medal, provided it shall have continued the Winner's property for, at least, one year after the award of the Medal, and shall have afterwards been the Tenant's property, and in his possession from the day fixed by the Regulations,—the 20th of May preceding the Competition. A Bull which may have been purchased by two or more Tenants, for the use of their stocks, will be allowed to compete, although the exhibitors may not be joint tenants. Purity of breed is to be taken into account in awarding the Premiums.

10. In order to entitle the Competitors to their respective Premiums, a regular Report, signed by the Convener, and, at least, a majority of the Committee who attend the Competition, must be transmitted by the Convener, so as to be received by the Secretary on or before the 10th of December next, and which Report must certify the following particulars, viz.:—

1. The total number of Bulls and Queys respectively offered for Competition.
2. The number of each admitted to Competition in their appropriate classes, with the number of Competitors in each class.
3. That the Bulls preferred were, *bona fide*, the property of the Competitors, and kept in their possession, or on their farms within the District, from the 20th of May preceding the Competition.
4. The whole periods during which the Bulls have been in their possession.
5. The ages of the Bulls.
6. That the Queys, being two years old, were bred by the Competitors, and were their property on the day of Competition.
7. The Names (Christian and surname) and Designations (Estate or Farm, and Parish) of the Persons to whom Premiums were adjudged, and the amount of Premium to each.
8. That due attention has been paid to the rule prescribed for the service of Bulls, for which Money Premiums are awarded.
9. The time and mode of the required previous intimation to the Committee of Judges, and notification to intending Competitors, &c. of the time and place of Competition, given, as directed by the Local Committee; and, in general, the strict observance of all the Rules of Competition, fixed by the Society, as above detailed.

In case all the Members of the Committee who may have attended the Competition shall not have subscribed the Report, the Convener will mention the cause which may have prevented their doing so.

11. Further, it is to be distinctly understood, that in no instance does any claim lie

against the Society for expenses attending a Show of Stock, beyond the amount of the Premiums offered.

12. With reference to the Competitions in the 2d and 6th Districts, the Reports must bear, that in the former, the Bulls and Queys preferred were of the Fifeshire breed; and in the latter, that they were of the West Highland Breed.

The Conveners are requested to get the Reports drawn up and signed by a majority of the Committee present at the Competition before they separate.

NOTE.—The Society gives the Premiums for three Competitions in alternate years; and provided the gentlemen of the District, or any Local Association therein, shall have continued the Competitions, and have awarded and duly reported Premiums in the District to an amount not less than one-half of the Society's Premiums, and for the same descriptions of Stock, during the two intermediate years, the Society continues its Premiums to the District for an additional year. By this arrangement, each District may have the benefit of six Competitions. In the district, No. 1, 1839 was the first year's Competition; Local Premiums were awarded in 1840 and 1842; and this year it has the Premiums for the sixth or additional year. In the Districts, Nos. 4, 5, 6, and 7, 1842 was the first Competition; the Society's Premiums will be again given in 1846; and if the Districts shall have given Local Premiums in 1843 and 1845, they will be entitled to the Society's Premiums in 1847. In the Districts, Nos. 8, 9, 10, 11, 12, and 13, 1841 was the first Competition; they will have the third year of the Society's Premiums in 1845; and if they shall have awarded Local Premiums in 1842 and 1844, they will each receive Premiums from the Society in 1846, for the sixth or additional year. In the District, No. 14, 1843 was the first year's Competition; it will again have the Society's Premiums in 1845 and 1847; and if it award Local Premiums in 1844 and 1846, the Society's Premiums will be given in 1848, for the sixth or additional year. Further, in order to encourage the Show for the Local Premiums, the Society, in those Districts in which the Honorary Silver Medal is offered, will continue it in the two intermediate years, under the same conditions as during the years when the Society's Premiums are given. A certificate of the Competition and Premiums awarded at the intermediate Local Shows in the several Districts, signed by at least two Members of the Society, must be transmitted to the Secretary of the Society, so as to be received by him on or before the 10th December in each year, in order to entitle the Districts to any claim for the additional year's Premiums.

§ II. HORSES.

1. PREMIUMS FOR IMPROVING THE BREED OF DRAUGHT HORSES.

The Islands of Orkney.

Twenty-five Sovereigns will be given by the Society, a sum not less than Twenty Sovereigns additional being given by the resident Gentlemen, or by Local Societies. Out of the Fund to be raised by the said joint contribution, the following Premiums will be given:—

1. For the best Stallion, not under three years and nine months, and not exceeding twelve years old, to be kept exclusively for the im-

provement of the breed of Draught Horses within the said District, and, for this purpose, to be shown after the Premiums have been awarded at such Stations as may be fixed by the Convener and Committee of Members of the Society resident in the District, at such time between the day of Competition and the 1st August 1845, as the Committee may fix at a Meeting to be called by the Convener for the purpose—Twenty-five Sovereigns.

2. For the best Mare for breeding Draught Horses, not exceeding twelve years old, and which shall have had at least one foal, or shall be in foal at the time, *bona fide* the property and in possession of any tenant in the said District, from 1st January 1845, to the day of competition—Ten Sovereigns.

3. For the best well-bred Pony Stallion, not exceeding 14 hands high, not under three years and nine months, and not exceeding twelve years old, to be kept within the District between the day of competition and 1st August 1845—Ten Sovereigns.

NOTE.—The Premium for the best Stallion, No. 1, must be awarded under the condition, that the Prize Mare, and the Mare next in merit, shall have a preference of Service by the Prize Stallion, free of Charge; all the Competing Mares to have a preference over other Mares to Service by the Prize Stallion, on such terms and conditions as the Local Committee shall fix. In awarding the Premiums, purity of breed, and the pedigrees of the animals, will be taken into consideration.

RULES OF COMPETITION.

1. The Members of the Society in the District are hereby appointed a Committee of Superintendence, as in No. 1. of the Regulations for the Cattle Competitions; and they will be convened by the Convener on or before the 10th of March, in the same manner and for purposes similar to those indicated in No. 2. of the said Regulations.

2. The Meetings of the Committee of Superintendence, and attendance at Competitions for Premiums, to be open to all Members of the Society; and not fewer than the prescribed quorum of the Committee to be present.

3. The time and place of Competition for the Premiums are to be fixed by the Convener, with the concurrence of at least a quorum of the Committee, and are to be published by him in due time, and in such manner as shall be thought by the Committee most effectual for the information of those interested.

4. The Competition will take place betwixt 20th March and 1st May 1845. The Regulations for Cattle Shows, in regard to the previous intimation to the Committee and Competitors—the recommendation to the Committee to take the assistance of practical men as Judges—the power of the Committee to exclude stock, if the animals produced shall be of inferior character, and, in certain circumstances, to make an allowance for stock of merit—those relating to extra expenses, and against Competitors being also Judges—and the manner in which the Report is to be certified and transmitted to the Society, are severally hereby declared applicable to the Premiums for Horses. Evidence must be produced that the Prize Stallion has had produce.

James Baikie, Esq. of Tankerness; in his absence, Charles Gordon Robertson, Esq., Sheriff-Substitute, to be Convener of the Society's resident Members; three to be a quorum of the Committee.

2. PREMIUMS FOR HIGHLAND PONIES.

The District of Mull in Argyllshire.

The Society, desirous of directing attention to the improvement of the breed of Highland Ponies, offers the following premiums in the above District in 1844, a sum of Five Sovereigns in part of the premiums being guaranteed from the District.

For the best Stallion, not exceeding 14 hands high, not under three years and nine months, and not exceeding twelve years old, to be kept within the District between 1st April and 1st August 1844—Ten Sovereigns.

For the best Mare, not exceeding 14 hands high, and not more than ten years old, and which shall have had a foal, or be in foal at the time, the property, and in possession of any tenant in the District, from 1st January 1842, to the day of competition—Seven Sovereigns.

NOTE.—The Committee are authorised, if they see proper, to apportion the two Premiums into four, and to award Five Sovereigns for a Stallion of the native or Highland breed, and Five Sovereigns for a Stallion brought from any other District. The Sum for Mares may be divided into two Premiums of Four and Three Sovereigns. The Premium for the best Stallion must be awarded under the condition that the Prize Mare, and the Mare which shall be declared by the Judges next in merit, shall have a preference of Service by the Prize Stallion, free of Charge. The Rules of Competition to be the same as those for Work Horses.

It has appeared to the Society that the demand which exists for this race of active little horses, not only in the Highlands, but in the Lowlands of Scotland and in England, and the decrease in the numbers of the better class suited to the saddle in Districts where they were formerly reared, particularly in the Western Highlands and Islands, afford a sufficient inducement to the Society to call the attention of Highland Proprietors and their Tenants to this production of the country; not, however, with a desire of increasing the numbers reared beyond what the interests of the Breeders and the existing demand may require, but for the purpose of maintaining the purity and valuable properties of the Breed, by a proper selec-

tion of the male and female parents. The Society also calls the attention of those interested, to the necessity of not allowing the young stock, which go at large, to copulate promiscuously, as this must have the effect of deteriorating the breed, and will render the Premiums offered quite inefficient for the purpose intended. It is most desirable that the colts not intended for stallions, should be castrated before attaining the age of one year.

Murdoch Maclaine, Esq., of Lochbuy, to be Convener of the Society's resident Members; three a quorum. The Report of the Competition to be transmitted to the Society by 10th December 1844.

§ III. SHEEP AND WOOL.

1. PREMIUMS FOR IMPROVING THE BREED OF SHEEP.

I. LEICESTER SHEEP.

DISTRICTS.

1. *A District round Ayr, including the low country portions of Ayrshire, Renfrewshire, Lanarkshire, and adjoining Counties.*
2. *A District round Dalkeith, comprehending the Lothians, Berwickshire, and adjoining Counties.*
3. *A District round Perth, comprehending the low country portions of Perthshire, and the adjoining Counties.*
4. *A District round Cupar in Fife, comprehending Fifeshire, and the contiguous portions of adjoining Counties.*
5. *A District round Kirkcudbright, comprehending the low country portions of Dumfries, Kirkcudbright, and Wigton Shires.*

PREMIUMS IN EACH OF THE SAID DISTRICTS.

For the best Tup of any age, the property of the Competitor, which shall have served in the District the preceding season, or which shall so serve the season following the Exhibition—Ten Sovereigns.

For the best three Shearling Tups, the property of the Competitor—Ten Sovereigns.

For the best Pen of three Ewes, not less than two Shear, the property of the Competitor—Five Sovereigns.

For the best Pen of three Gimmers or Shearling Ewes, the property of the Competitor—Five Sovereigns.

In Districts Nos. 1 and 2, the Competition will take place in 1844; and in Nos. 3, 4, and 5, in 1845.

For the First District—The Marquis of Bute; in his Lordship's absence, Colonel Kelso of Dankeith, and Archibald Hamilton, Esq., of Carcluie, Conveners of the Society's resident Members; five a quorum.

For the Second District—His Grace the Duke of Buccleuch; in his absence, Robert Scott Moncrieff, Esq., Convener of the Society's resident Members; five a quorum.

For the Third District—The Right Hon. the Earl of Mansfield; in his Lordship's absence, Andrew Murray, Esq., of Murrayshall; in absence of both, Archibald Turnbull, Esq., Secretary, Perthshire Agricultural Society, Convener of the Society's resident Members; five a quorum.

For the Fourth District—Right Hon. the Earl of Leven and Melville; in his Lordship's absence, Major Anderson of Montrave, to be Convener of the Society's resident Members; five a quorum.

For the Fifth District—Right Hon. the Earl of Selkirk to be Convener of the Society's resident Members; five a quorum.

II. CHEVIOT SHEEP.

DISTRICTS.

1. *The Isle of Skye, and contiguous Insular and Mainland Districts conveniently accessible to Portree, in the County of Inverness.*
2. *The District round Hawick.*
3. *The Parishes of Jedburgh, Southdean, Oxnam, Crailing, Hobkirk, Bedrule, Cavers, Morebattle, Yetholm, Hownam, Linton, and Eckford, in the County of Roxburgh.*
4. *A District round Moffat, comprehending the Pastoral Districts of Dumfriesshire, and of the adjoining Counties.*
5. *Ross-shire and Inverness-shire, comprehending the Pastoral Districts of these Counties within convenient reach of the Muir of Ord.*

PREMIUMS IN EACH OF THE SAID DISTRICTS.

For the best Tup of any age, the property of the Competitor, which shall have served in the District the preceding season, or which shall so serve the season following the Competition—Seven Sovereigns.

For the best Three Shearling Tups, the property of, and bred by the Competitor—Seven Sovereigns.

For the best Pen of Five Ewes, not less than Two Shear, the property of the Competitor—Five Sovereigns.

For the best Pen of Five Gimmers or Shearling Ewes, the property of, and bred by the Competitor—Five Sovereigns.

The Competition in the Districts Nos. 1 and 2, will take place in 1844; and in Nos. 3, 4, and 5, in 1845.

For the First District—Right Hon. Lord Macdonald and Norman Macleod, Esq. of Macleod, to be Conveners of the Society's resident Members; three a quorum.

For the Second District—Allan Elliot Lockhart, Esq. of Cleghorn, to be Convener of the Society's resident Members; three a quorum.

For the Third District—John Scotland, Esq. Glendouglas, to be Convener of the Society's resident Members; four a quorum.

For the Fourth District—J. J. Hope Johnstone, Esq. of Annandale, M.P.; in his absence, Charles Stewart, Esq., Hillside, to be Convener of the Society's resident Members; five a quorum.

For the Fifth District—Right Hon. Lord Lovat, and Sir James J. R. Mackenzie, Bart. of Scatwell, to be Conveners of the Society's resident Members; five a quorum.

III. BLACK-FACED SHEEP.

DISTRICTS.

1. *The District of Cowal, Argyllshire.*
2. *The District accessible to Kenmore, in Breadalbane.*
3. *The District accessible to Lochmaddy, including Barra, the Uists, Benbecula, Harris, and Lewis.*
4. *District of Atholl, including Glenerochy and Strathtummell, and Strathardle, Blackwater and Glenshee, above the Bridge of Calley, in the County of Perth.*

5. *Upper Ward of Lanarkshire.*
6. *A District round Fort-William, comprehending the portions of the Counties of Inverness, Argyll, and Perth, having convenient access to the place of Competition.*

PREMIUMS IN EACH OF THE SAID DISTRICTS.

For the best Five Tups, not exceeding four Shear, the property of any Proprietor, or of any Tenant in the District paying more than £150 of yearly rent—Seven Sovereigns.

For the best Five Tups, not exceeding four Shear, the property of any Tenant in the District paying not more than £150 of rent—Seven Sovereigns.

For the best Pen of Ten Gimmers or Shearling Ewes, belonging to any Proprietor, or to any Tenant in the District paying more than £150 of rent, and which shall be certified at the Competition to have been at least one year in his possession—Five Sovereigns.

For the best Pen of Ten Gimmers or Shearling Ewes, under the same condition, but being the property of a Tenant in the District paying not more than £150 of rent—Five Sovereigns.

The Competitions in the Districts Nos. 1, 2, and 3, will take place in 1844; and in Nos. 4, 5, and 6, in 1845.

For the First District—Robert Maclachlan, Esq. of Maclachlan; in his absence, Alexander Lamont, Esq. of Knockdow, to be Convener of the Society's resident Members; three a quorum.

For the Second District—The Marquis of Breadalbane; in his absence, Sir Neil Menzies of Menzies, Bart., to be Convener of the Society's resident Members; five a quorum.

For the Third District—Colonel Gordon of Cluny; in his absence, Charles Shaw, Esq., to be Convener of the Society's resident Members; three a quorum.

For the Fourth District—Right Hon. Lord Glenlyon, in his Lordship's absence, P. Small Keir, Esq. of Kinmonth, to be Convener of the Society's resident Members; five a quorum.

For the Fifth District—Sir Norman Macdonald Lockhart, Bart.; in his absence, R. G. Baillie, Esq. of Coulterallers, and Thomas Rennie Scott, Esq., to be Conveners of the Society's resident Members; five a quorum.

For the Sixth District—The Right Hon. Lord Ward and Colonel Maclean of Ardgour, to be Conveners of the Society's resident Members; three a quorum.

CONDITIONS AND RULES OF COMPETITION.

1. The Members of the Society in the several Districts are hereby appointed Committees of Superintendence, as in No. 1. of the Regulations for the Cattle Competitions; and they will be convened by their several Conveners on or before the 10th of May, in the same manner and for purposes similar to those indicated in No. 2. of the said Regulations.

2. The Meetings of the Committee of Superintendence, and attendance at Competitions for Premiums, to be open to all Members of the Society; and not fewer than the prescribed quorum of the Committee to be present.

3. It is an express stipulation in regard to the Premiums for Sheep, that the animals produced for Exhibition shall not have been grazed or fed, during the last season, in any way different from the rest of the *same class* in the flock to which they belong; and, with the exception of Shearling Ewes, no Ewes shall be allowed to compete but those which have reared Lambs the same season.

4. The boundaries of the Districts are very generally expressed, to enable Competitors to send Sheep to the Exhibition, who are within an attainable distance. The same Sheep, however, cannot draw the Premiums offered in more than one District in the same season.

5. The Competitions in 1844 will take place on such days between the 1st of June and 1st of November, as shall be fixed by the Committee.

6. It is recommended to the Committee, as in the case of Cattle Competitions, to take the assistance of practical men as Judges in awarding the Premiums. The Judges, in deciding the Premiums for Sheep, will have regard both to the wool and carcass of the animal. The regulations for Cattle Shows, in regard to the previous intimations to Judges and Competitors—the placing of the stock, and the number of Competitors required for Competition—the power provisionally granted to make an allowance for Stock of merit in the event of deficiency in number, and prohibiting Members acting as Judges who are also Competitors—the regulations relating to extra expenses—the serving of the males within the District—and the manner in which the Reports are to be certified and transmitted, are severally hereby declared to be applicable to the Premiums for Sheep.

7. The Society gives these Premiums in alternate years for three Competitions in each District; and provided, during the intervening years, they are continued in the District, and Premiums are awarded by Proprietors or Local Societies, and duly reported to the Society, to an amount not less than one half of the Society's Premiums, and for the same descriptions of Stock, the Society will continue its Premiums to the District for an additional year, thus affording to the Districts the benefit of six continuous exhibitions.

§ IV. SHEARING SHEEP.

With a view to promote improvement in the Shearing of Sheep, the Silver Medal will be given to the best Sheap-shearer in each of the Districts in which the Society's or Local Premiums for Sheep are in operation.

CONDITIONS.

1. Local Associations, or others who propose to claim these Medals, must, on or before

the 15th May 1844, lodge with the Society's Secretary, a satisfactory guarantee that Money Premiums shall be awarded at each Competition to the amount of not less than £2.

2. The District Conveners for the Sheep Premiums, with the aid of their Committees, shall fix the time and Place of Competition, and make all necessary arrangements.

3. The Medal shall not be awarded in any case where there are fewer than four Competitors; and it shall always accompany the highest Money Premium. The Sheep shall be divided into lots of six, distinguished by numbers, and the lot to be shorn by each Competitor shall be determined by the number he draws from a set of Tickets marked with corresponding numbers. The whole shall commence on a given signal, a person being appointed to note the time at which each Competitor finishes his task. The Judges shall examine each lot in their separate pens; and if two or more lots appear to be equally well executed, preference shall be given to that executed within the shortest time.

4. The Conveners shall report the particulars of the Competition, and the award of the Judges, to the Society, along with the Report of the award of the Sheep Premiums in the District.

V. WOOL.

1. LEICESTER WOOL GROWN IN SCOTLAND.

Class I.—1. For the best Fleece of Leicester Wool (without reference to the weight of the Fleece), clipped from a Shearling Tup at the ordinary clipping time in 1844—Five Sovereigns.

2. For the best Fleece of Leicester Wool (without reference to the weight of the Fleece) clipped from a Shearling Ewe of 1844—Five Sovereigns.

Class II.—3. For the best Fleece of Leicester Wool (the Fleece weighing not less than 7 lbs., nor more than 8 lbs.,) clipped from a Shearling Tup in 1844—Five Sovereigns.

4. For the best Fleece of Leicester Wool (the Fleece weighing not less than 6 lbs., and not more than 7 lbs.,) clipped from a Shearling Ewe in 1844—Five Sovereigns.

Class III.—5. For the best Fleece of Leicester Wool (the Fleece weighing not less than 8 lbs., nor more than 9 lbs.,) clipped from a Shearling Tup in 1844—Five Sovereigns.

6. For the best Fleece of Leicester Wool, (the Fleece weighing not less than 7 lbs., nor more than 8 lbs.,) clipped from a Shearling Ewe in 1844—Five Sovereigns.

Class IV.—7. For the best Fleece of Leicester Wool, (the Fleece not being less than 9 lbs. weight,) clipped from a Shearling Tup in 1844—Five Sovereigns.

8. For the best Fleece of Leicester Wool, (the Fleece not being less than 8 lbs. weight,) clipped from a Shearling Ewe in 1844—Five Sovereigns.

Class V.—On a comparison of the winning Fleeces in the four previous Classes, and judging relatively of their merits, both as to quality and weight.

9. To the Tup Fleece, which is considered, on the whole, as possessing the greatest merit—The Gold Medal, or Ten Sovereigns.

10. To the Ewe Fleece of greatest merit, under the same rule of judging—The Gold Medal, or Ten Sovereigns.

Class VI.—11. For the Fleece of any class among the unsuccessful Fleeces which is considered to have most merit, from its condition as to *washing and winding*—Five Sovereigns.

Class VII.—12. For the Fleece among the remaining Fleeces which possesses most merit on the score of *washing* alone—Five Sovereigns.

Note.—In all the Wool and Sheep Premiums by Shearling Tup or Ewe in 1844, is meant a sheep the produce of 1843.

RULES OF COMPETITION.

1. In Classes I. II. III. and IV., there must be at least three Competitors for each Prize, in order to the adjudging of the specified Premium; but in case of deficiency, in this respect, in any instance, it shall be allowable for the Judges to award to the Exhibitor of a fleece of merit, a sum not exceeding half the amount of the Premium; and both in those Classes, and in Classes VI. and VII., it shall, likewise, be at the discretion of the Directors, on the recommendation of the Judges, to present a limited number of Silver Medals to such Competitors who may fail to obtain money premiums, as shall appear to be deserving of this mark of distinction.
2. No Competitor to exhibit more than one Fleece for any one Premium.
3. The Fleeces exhibited to be at the disposal of the Society, and to be kept entire for a temporary deposit in their Museum, or to be broken down for the further testing of their merits in the course of experiments, as the Society may determine.
4. Fleeces presented and not admitted into the Competition, will be returned, if required, to the owners, provided they send for them within three months from the time of the Competition.
5. The Competition in the several classes is expressly restricted to specimens of wool fairly understood and admitted to be from sheep of the new Leicester breed; and a declaration in writing, subscribed

by the Exhibitor, must be made by each Competitor, that, to the best of his knowledge and belief, the Stock is free from any mixture of the Lincoln, Norfolk, Dorset, Cotswold, or any other cross.

6. Competitors will specify distinctly the particular Premiums for which they intend to compete; distinguishing them by the Classes in which they are offered, and by the numbers prefixed to them. They will also state the time of clipping, and give some account generally of the flocks from which the Fleeces are selected, their numbers, the general system of management, the size of the sheep, denoted by the average weight of quarter of the two-year-old wethers, and what proportion the average Fleeces of the flocks bear, both in point of quality and weight, to the specimens presented.

7. In judging of the merits of the Fleeces, the points which will be taken into consideration are, the *fineness of the fibre*, its *trueness*, *soundness*, *softness*, *elasticity*, *uniformity*, and a proper *length* of staple.

8. Competitors are requested to deliver their specimen Fleeces to Mr. Lawson, at the Society's Museum, George IV. Bridge, Edinburgh, on or before Wednesday the 24th of July 1844; and, as considerable inconvenience has been experienced, in consequence of Fleeces arriving after the day fixed for receiving them, notice is hereby given, that no Fleece can be admitted in Competition which shall not have been lodged and marked in the record at the Museum before six o'clock in the evening of the 24th July aforesaid. Each Fleece to be enclosed in a canvass bag, marked with a selected name or motto, and the same name or motto must be affixed by a card to the Fleece. A sealed letter must be enclosed in the bag, separate from the declaration, and the detail of particulars above referred to, and marked with the same name or motto. This letter must enclose the name and address of the Competitor, and will not be opened until the Premiums are decided, and then only in those cases where Premiums or Medals have been awarded.

9. After the delivery of the Fleeces at the Museum, the whole responsibility and care of weighing and judging as to their merits will be in the hands of the Society, who, for their own satisfaction, have resolved, upon this occasion, in addition to other means of judging more easily attainable at home, to avail themselves of the best assistance they can receive from England, by bespeaking the services of professional wool-staplers, and persons of known character and experience in the examination of wools and the assorting and division of Fleeces. Their object is to have the comparisons made more immediately under the eye of their Board of Directors, and in a manner proportionate to the importance they attach to this subject, which

they have reason to believe is not yet sufficiently understood in this country.

2. The following Premiums are to be awarded, in 1844, at

THE INVERNESS WOOL FAIR.

1. For the best sample of Cheviot Laid Wool, shown by the breeder of the stock, and consisting of not fewer than seven fleeces—Five Sovereigns.

2. For the best sample of Black-faced Laid Wool, shown by the breeder of the stock, and consisting of not fewer than seven fleeces—Five Sovereigns.

3. For the best sample of wool of a cross between a Leicester Tup and Cheviot Ewe—Five Sovereigns.

Competitors for these Premiums are required to state the number of Sheep of which the flock consisted, from which the sample is taken, the gross quantity clipped, whether the fleeces are Ewe or Wether, and, if sold, the price obtained. There must be at least three Competitors for the particular description of wool to authorise the award of the Premium; but should there not be this number in any class, the Committee are empowered to make such allowance to a party showing fleeces of merit, not exceeding the half of the amount of the Premium, as they may think reasonable. In deciding the Premiums it is recommended to take the assistance of Practical Judges.

The Society's Members resident in the neighbourhood of the place of competition to be a Committee for attending to all arrangements necessary, and are to be summoned by the Conveners, as suggested in No. 2 of the Regulations for District Cattle Shows. James M. Grant, Esq. of Glenmoriston, in his absence John Mackenzie, Esq. Inverness, to be Convener.

The Report of the Competition to be transmitted to the Society on or before the 10th of November 1844.

§ VI. SWINE.

PREMIUMS FOR IMPROVING THE BREED OF SWINE.

DISTRICT.

Mull, Morven, and Ardnamurchan.

1. For the best Boar, not under twelve months, and not exceeding four years old, *bona fide* the property, and in possession of any Proprietor or Tenant in the said District, in autumn 1844—Five Sovereigns.

2. For the second best—Three Sovereigns.
3. For the best Breeding Sow of the same age—Four Sovereigns.
4. For the second best—Two Sovereigns.

These Premiums to be awarded for animals that are considered most profitable, and best suited for the purpose of curing mess Pork. Attention is recommended to the introduction of the Berkshire or Suffolk breed of Swine, as being the best for curing Pork.

The Competition is to be held at Tobermory, at such time as the Society's Members resident in the District shall fix, at a meeting to be called by the Convener for the purpose, on or before the 1st of June. This meeting is also authorised to name a Committee for managing all details, and to fix the necessary regulations for Competition. A Report of the award of the Premiums, with a copy of the Regulations of Competition, to be transmitted to the Secretary on or before the 10th of December 1844.

Murdoch Maclaine, Esq. of Lochbuy; in his absence, John Stewart, Esq. of Achadashenaig, to be Convener.

CLASS VI.

PRODUCTS OF LIVE STOCK.

DISTRICT.

The Counties of Inverness, Ross, Cromarty, and Nairn.

I. CURING BUTTER.

The Premiums given, and regulations suggested, for promoting an improved system of Curing Butter, having been productive of highly satisfactory results, the following Premiums are offered in the above District in 1844, for the second Competition, to take place at Inverness.

1. To the owner of any Dairy in the said District who shall make and cure the best quality of Butter for the market, not being less than one cwt., (112 lbs. the cwt., and 16 oz. the lb.,) during the season 1844—Six Sovereigns.
2. For the second best quality as aforesaid—Four Sovereigns.
3. For the third best quality as aforesaid—Three Sovereigns.
4. For the fourth best quality as aforesaid—Two Sovereigns.

CONDITIONS.

The Butter must be certified to have been made and cured on the Competitor's farm during the season 1844, and the whole quantity produced at the Competition must not be less than one cwt. The certificate must be supported by the declaration of the Exhibitor. The Butter shall be inspected by a Committee of the Members of the Society resident within the district. The Committee, at a meeting to be called by the Convener for that purpose, shall fix such general regulations as they may consider proper; and they will, in particular, fix the day of Competition. The quality of the Butter to be tested by judges to be named by the Committee, in the way usually done by purchasers in the public market. In the event of two or more competing lots being deemed equal in quality, the Premium will be awarded to the Competitor who shall have cured the larger quantity. Although not required as a condition, it is strongly recommended, as affording facilities for sales, that the Butter should be packed in firkins containing 56 lb. each, or in earthen vessels which have not been glazed with preparations of lead, and of such size as may be suitable for sales. It is also suggested that the vessels containing the samples of Butter, should be of such form as to admit of their contents being easily turned out for inspection. The successful candidates, before receiving the Premiums, are required to transmit to the Secretary a detailed report of the whole process followed by them in the manufacture of their Butter. Reports of the award of the Premiums to be lodged with the Secretary of the Society, on or before the 10th December 1844.

John Macpherson Grant, Esq. younger of Ballindalloch, to be Convener of the Society's resident Members.

II. MAKING CHEESE.

To the owner of any Dairy in said District who shall make for sale, during the season 1844, and exhibit at a Competition at Inverness, the best quality of Cheese from Skimmed Milk, the quantity made not being less than 2 cwt.—Five Sovereigns.

For the second best quality of ditto—Three Sovereigns.

CONDITIONS.

It must be certified that the Cheese has been made on the Competitor's farm in 1844; and that the sample produced is a fair average specimen of the produce of the Dairy in that year. The conditions as to the general arrangements, time of Competition, and other particulars, to be the same as those above provided in regard to the Butter Premiums, in so far as these are applicable. Reports to be lodged with the Society by the 10th of December 1844.

John Macpherson Grant, Esq. younger of Ballindalloch, Convener.

CLASS VII.

COTTAGES.

1. PREMIUMS FOR THE BEST KEPT COTTAGES AND GARDENS.

In order to encourage Cottagers to keep their cottages and gardens neat and clean, the following Premiums will be given in the parishes

after-mentioned. One half of the Premiums is given by the Society, and the other half is contributed by the Members, or others, who applied for the Premiums.

Mid-Lothian.

PARISH OF CRANSTOUN.—Convener, the Earl of Stair; and in his absence, his Lordship's Factor.

PARISH OF KIRKLISTON.—Convener, Sir Alexander C. Maitland Gibson, Bart., of Cliftonhall.

PARISH OF NEWTON.—Convener, John Wauchope, Esq. of Edmonstone.

The Islands of Zetland.

PARISH OF TINGWALL.—Convener, William Hay, Esq. of Laxfrith.

County of Caithness.

PARISH OF LATHERON.—Convener, Donald Horne, Esq. of Langwell.

PARISH OF REAY.—Convener, James Sinclair, Esq. of Forss.

County of Dumfries.

PARISH OF JOHNSTONE.—Convener, J. J. Hope Johnstone, Esq. of Annandale, M.P.

PARISH OF KIRKPATRICK JUXTA.—Convener, J. J. Hope Johnstone, Esq. of Annandale, M.P.

PARISH OF APPLEGARTH.—Convener, Sir William Jardine, Bart., of Applegarth.

PARISH OF MIDDLEBIE.—Convener, E. Bradshaw Smith, Esq. of Blackwood House.

Stewartry of Kirkcudbright.

PARISH OF KIRKBEAN.—Convener, Mark S. Stewart, Esq. of Southwick; in his absence, William Maxwell, Esq. younger of Cardonness.

DISTRICT OF GLENKENS.—Convener, William Grierson Yorstoun, Esq. of Garroch.

PARISH OF CROSSMICHAEL.—Convener, John Hall, Esq. of Mollance.

County of Argyll.

PARISH OF KILMARTIN.—Convener, Neil Malcolm, Esq. of Poltalloch.

PARISH OF LOCHGILPHEAD.—Convener, Alexander Campbell, Esq. of Auchindarroch.

DISTRICT OF MORVEN.—Convener, Sir Charles Gordon of Drimnin.

DISTRICT OF ARDNAMURCHAN.—Convener, Sir James M. Riddell, Bart., and in his absence, his Factor.

DISTRICT OF KINGERLOCH.—Convener, C. H. Forbes, Esq. of Kingerloch.

DISTRICT OF ARDGOWER.—Convener, Colonel Maclean of Ardgower.

County of Aberdeen.

PARISH OF NEW PITSLIGO.—Sir John S. Forbes of Pitsligo, Bart.

County of Inverness.

PARISH OF INVERNESS.—Convener, Affleck Fraser, Esq. of Culduthel.

County of Berwick.

PARISH OF HUTTON.—Convener, W. F. Home, Esq. of Paxton.

PARISH OF EYEMOUTH.—Convener, Sir Samuel Brown of Netherbyres.

PARISH OF COLDINGHAM.—Convener, John Campbell Renton, Esq. of Mordington.

PARISH OF COLDSTREAM.—Convener, Rev. Mr. Goldie, Coldstream.

PARISH OF FOGO.—Convener, Richard Trotter, Esq. of Mortonhall.

County of Forfar.

PARISH OF KETTINS.—Convener, Robert Pillans Newton, Esq. Hallyburton.

Islands of Orkney.

PARISH OF ST OLA.—Convener, William Balfour, Esq. of Trenabie.

PARISH OF SHAPINSHAY.—Convener, David Balfour, Esq., younger of Trenabie.

PARISH OF ST. ANDREWS.—Convener, James Baikie, Esq. of Tankerness.

PARISH OF STENNIS.—Convener, William Balfour, Esq. of Trenabie.

County of Peebles.

PARISH OF INNERLEITHEN.—Convener, the Earl of Traquair.

PARISH OF TRAQUAIR.—Convener, the Earl of Traquair.

PREMIUMS.

1. For the best kept Cottage in each of the said Parishes—Two Sovereigns.

2. For the second best kept ditto—One Sovereign.

3. For the best kept Cottage Garden in each parish—One Sovereign.

CONDITIONS.

1. The Cottages may either be Single or in Villages. The names of intending Competitors may be intimated to the Conveners appointed by the Society, on or before the 20th of June next, and it shall then be competent to the Conveners to add to the list the names of such other individuals as they may think deserving of being brought forward; but after that day, no new name shall be admitted; and in every case the occupiers of Gentleman's Lodges, and Gardener's houses shall be excluded. The inspection of the *Cottages* and *Gardens* to take place between 20th June and 12th September. And, in making the inspection, the Conveners shall have power to take the assistance of any of the Members of the Society, or of any competent judge.

2. In order to authorise the awarding of the Premiums, the annual value of the Cottage of the Competitor, with the ground annexed, must not exceed £5 sterling, and there must at least be two Competitors in the District. No Cottage or Garden for which a Premium has been awarded by the Society, will be admitted in competition again for the same or a lower Premium. If the Cottage competing is occupied by the Proprietor, the roof must be in good repair. If the roof is of thatch, it must be in good repair, though in the occupation of a tenant. The windows must be free of broken glass, and perfectly clean, and must afford the means of ventilation. Dunghills and all other nuisances must be removed from the front and gables, and the Privy, where there is one, must be kept clean. The peat-stacks, if any, must be so placed as not to be a deformity; and the interior of the Cottage must be as cleanly kept as the nature of the Cottage admits of. In awarding the Cottage Premiums, the preference will be given to those who, in addition to these requisites, have displayed the greatest taste in ornamenting the exterior of their houses, with the ground in front and at the gables. In the event of there being only one Competitor, it will be in the power of the Committee to award one-half of the Premium, if the merits of the Cottage shall appear to be such as to deserve it.

3. In estimating the claims of Competitors for the Garden Premium, the Judges will have in view, 1st, The sufficiency and neatness of the fences; 2d, The cleanness of the ground, and neatness of the walks; 3d, The quality of the crops, and general productiveness of the Garden; and, 4th, The choice of crops. Much advantage is derived in some districts of Scotland from Cottagers cultivating, besides the more common crops, a portion of early potatoes along with the late, of early cabbage, early pease, cauliflower, lettuce, with some gooseberry and currant bushes, and a fruit-tree trained against the wall, &c.

4. Reports, stating that the various particulars before mentioned have been attended to, the number of Competitors, the names of the successful parties, and the nature of the exertions which have been made by them, must be transmitted by the Conveners to the Secretary of the Society, on or before the 10th day of October next.

5. The Premiums are given for four successive years in each parish. In any parish where the Convener may think it unnecessary to continue them for so long a period, he is requested to state this in his annual Report, and the Directors will be guided by his recommendation.

6. Similar Premiums will be given for four successive years in eight additional parishes, according to priority of application, on condition that a satisfactory guarantee for one-half of the amount of the Premiums to be given, shall be lodged by each parish with the Secretary, on or before the 1st of January 1815.

2. BEE HUSBANDRY.

If any of the above mentioned parishes shall wish to have a Premium instituted for promoting the cultivation of Bees among the peasantry, Ten Shillings will be granted annually for that purpose from the funds of the Society, also for a period of four years, on a guarantee for the like amount being received from the parish making the application. The conditions of competition will be arranged hereafter.

3. MEDALS TO COTTAGERS.

In the view of giving still farther encouragement to Cottagers of

the description referred to under the first branch of this Class, who do not reside in Parishes in which the regular Premiums are in operation, and at the same time of giving aid to Local Associations and public-spirited individuals, establishing or continuing at their own expense Premiums for the like objects, the Society will give its Cottage Medal to such Associations or public-spirited individuals as apply for the same, and may be desirous to add that testimony of approbation to such premiums, as they themselves bestow. The number of Medals to be issued annually is limited to twelve.

Application for these Medals, stating the nature and amount of the encouragement which is to be afforded by the parties applying, to be made to the Society on or before the 1st of July in each year, so that the Association or individual making the application may be enabled to intimate that the Medals are to be given. The Medals will afterwards be issued upon a Report, certified in the terms required by the preceding conditions, describing the merits of the Cottagers. The Reports to be lodged with the Secretary before the 10th November of the year in which the application is made.

4. PREMIUMS TO PROPRIETORS FOR BUILDING AND IMPROVING COTTAGES.

1. *The County of Haddington.*
2. *The County of Inverness.*

In order to mark the sense which the Society entertains of the advantages likely to result to the country, by Landed Proprietors exerting themselves to improve the style and comfort of Cottages on their estates; and in order to call the attention of such Proprietors to the subject, the Society proposes to give the following Premiums:—

1. FOR BUILDING COTTAGES.

1. To the Proprietor in each of the said districts who shall erect on his estate, during the year 1844, 45, or 1846, the best and approved Cottage—The Honorary Silver Medal.

2. To the Proprietor in each of the said districts who shall have erected on his estate, during the years 1843, 44, 45, and 1846, the greatest number of approved Cottages—The Gold Medal.

2. FOR IMPROVING EXISTING COTTAGES.

3. To the Proprietor in each of the said districts who shall improve and enlarge, where necessary, during the years 1844, 1845, and 1846, the greatest number of his existing Cottages — The Gold Medal.

The claims of intending Competitors for the Premium, No. 1, must be lodged with the Conveners of the Committee of the Society in the said Counties, on or before the 1st of October in the year in which the claim is made, otherwise they will not be entitled to compete; and those for the Premiums Nos. 2 and 3 in the same manner, on or before the 1st of October 1846. The inspection of the Cottages to take place between the 1st October and the 1st November in the year in which the claim is made, for the Premium No. 1, and between the same dates in the year 1846 for the Premiums Nos: 2 and 3.

Reports by the Conveners to be transmitted to the Secretary of the Society on or before the 30th of November in each year.

In order to authorise the award of the Premiums, the annual value of the Cottage or Cottages separately, with garden-ground, must not exceed £5 Sterling, and in awarding the Premium No. 2, the Cottage for which the Premium No. 1. has been awarded, shall be deducted from the number.

In estimating the claims of Competitors, the following points will be kept in view.—1st, The situation of the Cottage with reference to amenity of climate and aspect, and to the means of drainage, ventilation, and of preserving cleanliness. 2d, The suitableness of the structure to withstand the effects of the climate of the district. 3d, The accommodation in the interior of the Cottage, and the arrangement of the out-houses, more especially the privy and the ash-pit, which must be as much as possible out of sight, and screened by a few trees or shrubs. No Cottage without a privy to be entered for Competition. 4th, The small expense of the building, &c. compared with its durability, and with the accommodation afforded, and calculated with reference to the price of materials, and other circumstances, which may vary in different districts. 5th, The outward appearance of the Cottage or Cottages. When it appears that the Cottages of one Competitor are superior in point of style and comfort to those of another, though not so numerous, the Inspectors to give the preference to the former, provided that they amount at least to the number of five, and have been erected at a moderate expense.

Parties competing to forward plans, specifications, and estimates, to the Society, through the Conveners of the Districts, from which, and of all information sent therewith, copies may be taken for publication, if the Society shall see fit, and the originals returned to the parties within six months, if desired.

The Members of the Society in the respective Counties, or in the neighbourhood of the Cottages competing, are appointed Committees to inspect the Cottages, and report on the claims, with power to name Sub-Committees.

For the First District.—Sir George Grant Suttie, Bart., of Prestongrange, and James Hunter, Esq., of Thurston, to be Conveners.

For the Second District.—James M. Grant, Esq., of Glenmoriston, and John Stewart, Esq., of Belladrum, to be Conveners.

5. USE OF THE SPADE.

The Society, with the view of promoting dexterity in the use of the Spade, will give the following Premiums in the parishes after mentioned, viz.

Inverness-shire.

Parish of Slate, and Parish of Strath, both in the Isle of Skye.—Convener, Lord Macdonald.

Mid-Lothian.

Parish of Penicuik.—Convener, Sir George Clerk of Penicuik, Bart.; in his absence, Dr. Madden, Penicuik, and Mr. Maclean, Braidwood.

Dumfriesshire.

Parish of Middlebie.—Convener, E. Bradshaw Smith, Esq. of Blackwood House.

Parish of Canobie.—Convener, George Scott Elliot, Esq., of Larriston.

Perthshire.

Parish of Redgorton.—Convener, Robert Graham, Esq. of Balgowan.

PREMIUMS.

For the best specimen of Spade Work in each of these Parishes, at a competition between not fewer than twelve Competitors—the sum of £1, 5s.

For the second best, 15s.

For the third best, 10s.; And 30s. will be at the disposal of the Convener and Committee, for division among the unsuccessful Competitors.

CONDITIONS.

At least one month before the day of Competition, the time and place of competition, the quantity of ground to be turned over by each Competitor, the depth to which it is to be dug, the manner in which the spits are to be laid, and the time to be allowed for the performance of the work (which, in all cases, care will be taken shall be ample,) shall be fixed and declared by the Convener; and, where practicable, the Convener shall, by the same time, have dug, in a centrical situation, a piece of ground affording a sufficient specimen of the manner in which the work is to be performed, which is to be done by the spade only, and not by the shovel. The Convener shall decide the Premiums with the assistance of such other members of the Society as may attend. Failing the attendance of more than one Member, the assistance of competent judges to be

taken. In case of perfect equality, the preference to be given to the Lot which is first finished. Gardeners and persons who have gained first Premiums to be excluded from competing. The Competitions must take place on or before the 11th of November next, and be reported to the Secretary of the Society on or before the 1st December following. Any parish failing to report within the time specified, will forfeit the benefit of the Premiums in future years.

The like premiums will be given in four additional parishes in the year 1845, and three succeeding years, on guarantees to the amount of half of the Premiums offered being lodged with the Secretary by the parties making the application, on or before the 1st of January next.

NOTE.—These Premiums are proposed chiefly for the benefit of Districts in which there is a redundant population.

6. PREMIUMS FOR GREEN CROPS ON SMALL POSSESSIONS.

The Society, with the view of improving the cultivation of small possessions, by the introduction of Green Crops, will give the following Premiums in the Parishes after mentioned, viz.

Perthshire.

PARISHES OF KENMORE AND KILLIN.—Convener, the Marquis of Breadalbane.

Aberdeenshire.

PARISH OF NEW PITSLIGO.—Convener, Sir John Stuart Forbes, Bart. of Pitsligo.

Argyllshire.

PARISH OF BOWMORE AND KILMENY.—Convener, W. F. Campbell, Esq. of Islay, M.P.; and in his absence, Mr. Chiene, his Factor.

For the best and approved Green Crop—Three Sovereigns.
For the second best do.—Two and a-half Sovereigns.
For the Third best do.—One and a-half Sovereign.
For the fourth best do.—One Sovereign.

CONDITIONS.

1. The Competition to be limited to Tenants occupying not more than 30 acres of land.

2. The quantity of ground under Green Crop to be fixed by the Convener,—at least one half of the Green Crop to be Turnips, and that portion which is in Green Crop in 1844 must be sown out, with sufficient quantities of Clovers and Rye Grass, with the White Crop in 1845.

3. The names of intending Competitors may be intimated to the Conveners appointed by the Society, on or before the 15th day of May 1844; and it shall then be competent to the Convener to add such others to the List as he may think deserving of encouragement, but after that day no additional name shall be received.

4. There must not be fewer than two Competitors in each District; and the Convener and Committee shall have power to withhold the Premiums, or divide them in such

manner as they shall consider most equitable. The gainer of the first Premium to be precluded from competing in subsequent years. In the event of there being only one Competitor, it will be in the power of the Committee to vote a portion of one of the Premiums, if his merits shall appear to be such as to deserve it.

5. The Inspectors to be fixed by the respective Conveners, who, with the assistance of such other Members of the Society as may attend, shall decide the Premiums.

The awards to be made and intimated to the Secretary of the Society on or before the 1st of December in each year; and Conveners are particularly requested to state in their reports the proportion of each lot cropped, as above mentioned, and to offer any suggestions which they may consider of importance.

Similar Premiums will be given in each of the above Parishes for the next three years, and in four additional Parishes for the year 1845, and three succeeding years, on similar guarantees being lodged with the Secretary on or before the 1st of October 1844.

In order that the Premiums offered may be made known to the industrious Cottagers, the Society trusts much to the obliging co-operation of the Clergy in the Counties in which the Cottage Premiums are offered.

CLASS VIII.

WOODS AND PLANTATIONS.

1. HONORARY PREMIUMS FOR EXTENSIVE PLANTING.

To the Proprietor who shall, within a period of five years immediately preceding, have planted on his property the greatest extent of ground, not being less than 300 acres, and who shall communicate to the Society, on or before the 10th of November in any year, a satisfactory report of his operations, embracing the expense, description of soil, age, and kind of trees planted, the number of each sort per acre, mode of planting, extent of " beeting up," and general progress of the plantation, with such observations as his experience may suggest—The Gold Medal.

2. REPORTS ON RECENT PLANTATIONS.

To the Proprietor who shall communicate to the Society, on or before the 10th of November in any year, the most satisfactory Report on the Planting of Land, founded on experiment; and who shall accordingly have planted on his own property an extent of not less than fifty acres, within a period of not more than ten nor less than four years preceding the date of his Report—The Gold Medal.

The Report should comprehend every interesting particular: among others, the exposure and altitude of the place, and general character of the soil—whether lime has been used, and, if so, its mode of application and apparent effect—the same of any sort of

manure or other fertilizing substance—the mode of fencing and of planting adopted—the kind of trees planted, and the number of each kind per acre—their relative progress—the proportion of blanks or deaths at the end of three years—the state of the plantations at the date of making the report—and the expense per acre, as nearly as can be calculated.

3. PLANTATIONS ON HIGH ALTITUDES.

The Gold Medal, or Plate of the same value, will be given for the best and approved account of existing Plantations in Scotland, at altitudes not under 600 feet above the level of the sea.

This Premium is offered with a view to ascertain the highest altitude at which trees may be advantageously planted in different districts of the country; and competitors are desired to mention correctly the altitude above, and distance from the sea, of the plantations forming the subject of their report; the medium elevation of the plantations above the valleys in which they may be situated, and the medium altitude of each valley above the sea; the nature and depth of the soil, subsoil, and description of the subjacent rocks; whether lime has been used, and if so, its mode of application and apparent effect, —the same of any sort of manure, or other fertilizing substance; and also to state the kinds of shelter, natural or artificial (if any) which may have tended to assist the growth of the trees, especially in their earlier stages.

It is further required that the kinds of trees be mentioned, together with the average amount of their annual growth and quality of timber, and that the same be illustrated by accompanying specimens; and also what influence the plantations may have had on the under and neighbouring pasture. Reports to be lodged on or before the 20th October 1844.

4. ON PLANTING WITHIN THE INFLUENCE OF THE SEA, OR ON EXPOSED BARREN TRACTS.

The Gold Medal, or Plate of the same value, will be given for an approved Report on successful Planting within the influence of the sea, or on very bleak, peaty, or sandy tracts; the Report being founded on observation of the habits and appearance of the different sorts of trees considered as best suited for such situations.

Great disappointment having arisen to landed proprietors, in different parts of this country, in planting Waste Grounds, especially on the sea coast, the above premium is offered, with a view of directing attention to the subject.

Information is particularly desired regarding trees calculated for growing in situations unfavourable to the health of most of the more generally cultivated sorts, as in bleak heaths, barren sandy links, and exposed maritime situations; and, with respect to the last of these, the value of the *Pinus Pinaster*, or the more hardy variety of that tree from the downs of Bourdeaux, (called *Pinus maritima minor*,) should be ascertained.

The Reporter is requested to specify the nature not only of the surface soil, but of the subsoil, rocks, and geological character of the District reported on; with its elevation, exposure, and distance from the sea.

Reports to be lodged on or before the 20th October in any year.

5. FORMATION OF ARBORETUMS.

To the proprietor in Scotland who shall, on or before the 20th of October in 1844, or in any subsequent year, submit to the Society an approved Report of his having planted the most extensive and judiciously arranged collection of hardy, or supposed hardy, forest and ornamental trees—either species or marked varieties—Twenty Sovereigns, or a Piece of Plate of that value.

There is reason to believe that important arboricultural knowledge may be obtained by the judicious formation of Arboretums in various parts of the country, where opportunities may be afforded of comparing the growth and habits of the different species and varieties of hardy Trees. It is required, therefore, that such Arboretum shall be formed, so as to afford proper space for the future development of each specimen. The Report must specify the date of planting, with the age and height of each specimen at that time. It must also state whether the tree is a seedling, a cutting, a layer, or a grafted plant; and if the latter, on what stock it had been grafted. Information must be afforded relative to the nature and previous preparation of the soil, the altitude and exposure of the place; mentioning also, whether it be in the vicinity of a large town, manufactory, lake, or marsh, where smoke or hoar frost may be supposed to exert their influence on the growth of the plants generally, or on any particular section or sections of them. Any means used for protecting or fencing the Arboretum should be stated.

The Report must be accompanied with a correct Plan of the Arboretum, on a scale of not less than two inches to the chain, showing the relative disposition of each specimen, which may be marked on the Plan thus (2), the figure in the centre corresponding with that attached to the name contained in the Report, or in an accompanying List. In cases where such a plan cannot well be made, (as, for

example, where an Arboretum is formed on the sides of an approach to a mansion-house, which will often be found an admirable locality for the purpose,) an accurate description of the distribution and arrangement of the trees must be given.

6. PLANTATIONS OF PINUS SYLVESTRIS IN SCOTLAND.

For the best and approved Report of the Plantations of *Pinus sylvestris* in any District in Scotland—The Gold Medal, or Plate of the same value will be given.

It is required that the Report shall embrace a considerable District of country, and that at least two separate plantations, on different soils or exposures, be reported on, containing not less than one hundred imperial acres, and consisting of useful sized timber, not less than forty years old; the mode of planting and after management (so far as the reporter may be enabled to ascertain the same) to be stated, as well as the return which the thinnings, &c., may have already yielded; also the yearly value of the ground before planting; together with the present value and condition of the trees and pasture.

It is farther especially required that the Reporter describe minutely the nature of the soil and subsoil, also enumerate the plants forming the natural herbage; and should any difference exist in the health and quality of the trees in different parts of the plantations, a statement of the supposed causes producing such will be necessary. Transverse sections, at least six inches in depth, of the different qualities of the timber to be transmitted with the Reports, which are to be lodged by the 20th October 1844.

7. NATURAL LARCH FORESTS.

The Gold Medal will be given for the best and approved Report, founded on actual observation, relative to the state of the Larch Forests of Switzerland and the Tyrol.

The above Premium is offered with a view of ascertaining the description of soils, situations, &c., in which the Larch naturally attains to the greatest perfection.

Reporters are, therefore, required to describe the nature of the soil, subsoil, and underlying rocks on which the finest natural Larch timber is produced, together with the climate, altitude, and exposure of such localities. As also, what diseases and insects are most injurious to the health of the trees, and under what circumstances these are most prevalent. It is farther desirable, that Reporters state whether any difference has been observed in the quality of Larch Timber grown on different soils, or in that of different varie-

ties of trees distinguished by their foliage, habit of growth, colour of flower, or otherwise. Also, whether the diseases termed *Rot* and *Canker*, (Loudon's Arboretum Britannicum, pages 2385 and 2387,) so prevalent in various parts of Britain, are known in the natural forests; and, if so, on what soils, and under what circumstances, these diseases are most injurious.

Reports to be lodged on or before the 20th October 1845.

8. DISEASES OF THE LARCH.

Twenty Sovereigns, or a Piece of Plate of the same value, will be given for the best and approved Report on the Diseases which prevail in the Larch Plantations of Scotland.

The writer is required to describe the different diseases commonly called *heart rot, canker,* and *white bug*, and to state the manner in which they appear to affect various parts of the plant, as the root, the trunk and bark, the leaves, and the fruit or cones. He is required to direct attention to the annual layers in the wood of trees that have been felled, so as to ascertain, if possible, the period or year in which a decay of vigour first exhibited itself in the plants affected.

The writer is farther requested to state the age of the trees at which the diseases most generally manifest themselves; the situations in which they have chiefly appeared, with respect to the geological formation; the wetness, dryness, stiff nature, or other conditions of the soil or subsoil; elevation, exposure, checks of growth from pruning or other causes; and evils arising from inattention to proper thinning; and to mention whether the larch had been planted soon after a previous crop of Scotch fir or other timber had been removed from the ground. He is especially required to observe, whether, and under what circumstances, trees have, in any case, escaped injury, or whether from any obvious cause the diseases, after appearing, have spontaneously ceased; and he is requested to ascertain, as far as possible, the kinds of seed that have been used, whether they have been derived from the cones of trees cultivated in this country, or procured from the forests of Switzerland and the Tyrol.

Farther, as it is highly important to ascertain if any means exist of averting the progress of decay, and restoring the vigour of the trees affected, experiments with this view will be considered with especial favour.

The Report must be accompanied with such specimens of the timber, soils, rocks, &c., as may tend to illustrate any particular remarks or opinions of the author.

Reports to be lodged on or before 20th October 1845.

9. FOREST TREES.

For the best and approved Report of useful Forest or Timber Trees, now existing, or recently cut down, within the Counties of Aberdeen, Forfar, Banff, and Kincardine—The Medium Gold Medal.

It is required that the Report shall embrace at least ten different species of trees. The principal object being to ascertain what kinds are likely to be most successful and profitable in various situations. The Report must specify correctly the species of trees, the nature of the soil and of the sub-soil, and rock, strata, or geological formation; the distance from the sea, and height above its level; with the nature or aspect of the situation generally; the age of the trees as nearly as this can be given; the progress of growth (if observed) for every ten or five successive years; the size, particularly the girth, at three feet from the ground; the height and cubic contents; and, where the trees have been felled, the quality of the timber, and the uses to which it is chiefly applicable.

Information is desirable as to perasitical plants and insects which affect the same sorts of trees in different localities, and at different ages; and notices regarding remains of Forest Trees found in the peat mosses of the districts will be interesting.

Reports to be lodged on or before the 20th of October 1845.

10. ON RECENTLY INTRODUCED CONIFERÆ.

To the person who shall, on or before the 20th October in any year, submit to the Society an approved Report on the results attending his culture of the recently introduced Coniferous Trees—The Gold or Silver Medal, according to circumstances.

It is the wish of the Society to ascertain how far the various recently introduced kinds of the Pine or Fir Tribe are likely to prove either useful or ornamental trees in the climate of Scotland; such as *Cedrus Deodara* and *Pinus excelsa*, from Nepaul; *Abies Douglasii* and *A. Menziesii*, from North West America and California; *Araucaria imbricata*, from Chili; and *Pinus Austriaca*, or Black Pine, and *Pinus Cembra Helvetica*, or Swiss Stone Pine. Information is therefore desired as to the Soils and exposures which seem best adapted for these different species, or as many of them that have been cultivated by the Reporter; also as to the advantage of sheltering any of them while young, by means of Scotch Firs, or Spruces, as nurses. Comparative statements should be given, as far as possible, between their respective progress in growth and that of the more commonly

cultivated sorts, such as Scotch Fir, Larch, Spruce, and Silver Fir; and their comparative general qualities, as forest or ornamental trees, should also be mentioned.

11. MORE EXTENDED INTRODUCTION OF KNOWN SPECIES OF THE FIR TRIBE.

To the person who shall, within six years from 1842, inclusive, have introduced from any part of the world, seeds capable of germination, the produce of hardy species of the Fir Tribes which have been already introduced into Britain, but of which only a few plants have been raised—The Gold or the Silver Medal, or a Piece of Plate of such value as the Directors may, in the circumstances of the case, deem adequate.

It is required that the quantity of seeds of each species imported shall be sufficient to afford at least 250 seedling plants; and farther, that before the Premium be awarded, the number of seedling plants of each species actually raised in Scotland, shall not be less than 50. Attention is particularly directed to *Araucaria imbricata*, *Pinus ponderosa*, *Lambertiana*, and *Sabiniana;* to *Abies Douglasii*, *nobilis*, *grandis*, and *Menziesii;* and to *Taxodium sempervirens*, which last is abundant in the vicinity of St. Francisco, and throughout the low sandy plains of California. Intending Competitors are referred to the Premium No. 20, Class I., Essays and Reports, as to the manner in which seeds ought to be transmitted to this country. Reports to be lodged by 10th November 1848.

CLASS IX.

THE GENERAL SHOW OF LIVE STOCK, AND AGRICULTURAL MEETING AT GLASGOW IN 1844.

The Society having resolved to hold the General Show of Live Stock and Agricultural Meeting for 1844 at GLASGOW, the following PREMIUMS are offered to be then awarded by the Society, aided by liberal donations from Noblemen, Gentlemen, and Agricultural Associations in the Counties more immediately interested, and from the City of Glasgow.

The Competition is open to Stock from every part of the United Kingdom. The Show will take place on the Green of Glasgow, on the 7th, 8th, and 9th of August.

The arrangements will be :—

Wednesday, 7th August.—The Exhibition of the Agricultural Implements, Dairy Produce, Roots, Seeds, and Plants.

Thursday, 8th August.—The General Show of Cattle, Horses, Sheep, Swine, and the whole of the articles enumerated above, exhibited on Wednesday.

Friday, 9th August.—The Exhibition of the Prize Stock, Implements, and other articles.

§ I. CATTLE.

SHORT-HORN BREED.

Class I.—For the best Bull, calved after 1st January 1840—Forty Sovereigns.

For the second best ditto—Twenty-five Sovereigns.

To the *Breeder* of the best Bull in this class—The Honorary Silver Medal.

II. For the best Cow—Fifteen Sovereigns.

For the second best ditto—Ten Sovereigns.

Class III. For the best Heifer, calved after 1st January 1842—Ten Sovereigns.

For the second best ditto—Seven Sovereigns.

IV. For the best Heifer, calved after 1st January 1843—Ten Sovereigns.

For the second best ditto—Seven Sovereigns.

V. For the best two Oxen, calved after 1st January 1841—Fifteen Sovereigns.

For the second best ditto—Ten Sovereigns.

VI. For the best two Oxen, calved after 1st January 1842—Ten Sovereigns.

For the second best ditto—Seven Sovereigns.

AYRSHIRE BREED.

VII. For the best Bull, calved after 1st January 1840—Thirty Sovereigns.

For the second best ditto—Twenty Sovereigns.

For the third best ditto—Ten Sovereigns.

To the *Breeder* of the best Bull in this class—The Honorary Silver Medal.

VIII. For the best Bull, calved after 1st January 1842—Twenty Sovereigns.

For the second best ditto—Ten Sovereigns.

For the third best ditto—Seven Sovereigns.

Class IX. For the best Cow in Milk—Twenty Sovereigns.

For the second best ditto—Ten Sovereigns.

For the third best ditto—Seven Sovereigns.

X. For the best Cow in Milk, calved after 1st January 1841—Ten Sovereigns.

For the second best ditto—Five Sovereigns.

For the third best ditto—Three Sovereigns.

XI. For the best three Cows in Milk, bred and reared by the Exhibitor—Ten Sovereigns.

For the second best ditto—Five Sovereigns.

XII. For the best three Cows in Milk, the same having been stall-fed and had a calf, at least six months previous to the 1st of August 1844. Their appearance as to Milk, and their condition as to Fat, to be taken into consideration—Ten Sovereigns.

XIII. For the best Heifer, calved after 1st January 1842, bred and reared by the Exhibitor—Ten Sovereigns.

For the second best ditto—Seven Sovereigns.

For the third best ditto—Five Sovereigns.

XIV. For the best three Heifers, calved after 1st January 1842—Ten Sovereigns.

For the second best three ditto—Five Sovereigns.

XV. For the best two Oxen, calved after 1st January 1840—Ten Sovereigns.

WEST HIGHLAND BREED.

XVI. For the best Bull, calved after 1st January 1840—Thirty Sovereigns.

For the second best ditto—Twenty Sovereigns.

For the third best ditto—Ten Sovereigns.

To the *Breeder* of the best Bull in this class—The Honorary Silver Medal.

XVII. For the best Bull, calved after 1st January 1842—Ten Sovereigns.

For the second best ditto—Seven Sovereigns.

For the third best ditto—Five Sovereigns.

XVIII. For the best Cow which has reared a Calf during the Season of the Show—Fifteen Sovereigns.

For the second best ditto—Seven Sovereigns.

For the third best ditto—Five Sovereigns.

XIX. For the best three Cows, bred and reared by the Exhibi-

tor, which have reared Calves during the Season of the Show—Ten Sovereigns.

CLASS XX. For the best Heifer, calved after 1st January 1842, bred and reared by the Exhibitor—Seven Sovereigns.

For the second best ditto—Five Sovereigns.

XXI. For the best three Heifers, calved after 1st January 1842—Seven Sovereigns.

For the second best three ditto—Five Sovereigns.

XXII. For the best two Oxen, calved after 1st January 1840—Ten Sovereigns.

For the second best two ditto—Five Sovereigns.

XXIII. For the best two Oxen, calved after 1st January 1841—Ten Sovereigns.

For the second best two ditto—Five Sovereigns.

XXIV. For the best two Oxen, calved after 1st January 1842—Ten Sovereigns.

For the second best two ditto—Five Sovereigns.

XXV. For the best two Oxen, calved after 1st January 1841, which have not been housed or confined in a straw-yard since Whitsunday 1842—Ten Sovereigns.

XXVI. For the best five Oxen, calved after 1st January 1843, bred and reared by the Exhibitor—Ten Sovereigns.

GALLOWAY, ANGUS, AND ABERDEEN POLLED BREEDS.

XXVII. For the best two Oxen, calved after 1st January 1840—Fifteen Sovereigns.

For the second best two ditto—Ten Sovereigns.

For the third best two ditto—Five Sovereigns.

XXVIII. For the best two Oxen, calved after 1st January 1841—Fifteen Sovereigns.

For the second best two ditto—Ten Sovereigns.

FIFE BREED.

XXIX. For the best two Oxen, calved after 1st January 1840—Ten Sovereigns.

ANY BREED.

XXX. For the best two Oxen, pure or cross, calved after 1st January 1840—Fifteen Sovereigns.

For the second best two ditto—Ten Sovereigns.

XXXI. For the best Ox, pure or cross, calved after 1st January 1840—Ten Sovereigns.

CLASS XXXII. For the best Dairy Cow—Ten Sovereigns.

For the second best ditto—Five Sovereigns.

§ II. HORSES.

CLASS I. For the best Cart Stallion for Agricultural purposes not exceeding eight years old—Forty Sovereigns.

For the second best ditto—Twenty-five Sovereigns.

For the third best ditto—Fifteen Sovereigns.

NOTE.—The prize Horses to serve in Season 1845, according to the arrangement which may be made by the Committee. The number of Mares to be served by each Horse not to exceed eighty.

II. For the best Draught Mare for Agricultural purposes—Twenty-five Sovereigns.

For the second best ditto—Fifteen Sovereigns.

For the third best ditto—Seven Sovereigns.

III. For the best Brood Mare, having had a foal in 1844—Ten Sovereigns.

For the second best ditto—Five Sovereigns.

IV. For the best entire Colt for Agricultural purposes, foaled after 1st January 1841—Fifteen Sovereigns.

For the second best ditto—Seven Sovereigns.

V. For the best ditto, foaled after 1st January 1842—Ten Sovereigns.

For the second best ditto—Five Sovereigns.

VI. For the best ditto, foaled after 1st January 1843—Five Sovereigns.

VII. For the best Gelding for ditto, foaled after 1st January 1841—Ten Sovereigns.

VIII. For the best Filly for ditto, foaled after 1st January 1841—Fifteen Sovereigns.

For the second best ditto—Seven Sovereigns.

IX. For the best ditto, foaled after 1st January 1842—Ten Sovereigns.

For the second best ditto—Seven Sovereigns.

X. For the best ditto, foaled after 1st January 1843—Five Sovereigns.

XI. For the best pair of Horses or Mares, of any age, adapted for Agricultural purposes—Ten Sovereigns.

For the second best pair of ditto—Five Sovereigns.

The term "Horse" is here understood to signify Horse or Mare.

XII. For the best two Cart Horses or Mares, the same having

been in the possession of the Exhibitor, and chiefly worked upon the streets of Glasgow, anywhere within the Parliamentary boundaries, for one year previous to the Show, to be exhibited in the Harness in common use for the preceding month, and by the Driver—Ten Sovereigns.

For the second best ditto—Five Sovereigns.

Silver Medals to be given to the Drivers of the best two Cart Horses or Mares, Class No. XII., provided that they have been twelve months at least in the service of their employers; or a Medal to either who has been so.

Class XIII. For the best Cart-Horse or Mare, the same having been in the possession of the Exhibitor, and driven by himself chiefly upon the streets of Glasgow, anywhere within the Parliamentary boundaries, for one year previous to the Show, to be exhibited in the harness in common use during the preceding month, and by the Owner—Ten Sovereigns.

§ III. SHEEP.

BLACK-FACED BREED.

Class I. For the best three Tups not exceeding forty-five months old—Fifteen Sovereigns.

For the second best three ditto—Ten Sovereigns.

For the third best three ditto—Five Sovereigns.

II. For the best pen of Five Ewes, not exceeding five years and seven months old, selected from a regular breeding Stock of not fewer than a hundred, and the pen having reared Lambs for three months during the Season previous to the Show—Ten Sovereigns.

For the second best pen of five ditto—Five Sovereigns.

III. For the best pen of Five Gimmers—Ten Sovereigns.

For the second best pen of five ditto—Five Sovereigns.

IV. For the best pen of five Dinmonts—Ten Sovereigns.

For the second best pen of five ditto—Five Sovereigns.

V. For the best pen of five Tup Lambs—Seven Sovereigns.

For the second best pen of five ditto—Five Sovereigns.

VI. For the best pen of five Wether Sheep, not exceeding three years old—Five Sovereigns.

For the second best pen of five ditto—Three Sovereigns.

VII. For the best pen of five Wethers, not exceeding three years old, fed exclusively on hill pasture since twelve months old—Five Sovereigns.

For the second best pen of five ditto—Three Sovereigns.

Class VIII. For the best pen of five Wethers, of any age, showing most symmetry, fat, and weight—Five Sovereigns.

For the second best pen of five ditto—Three Sovereigns.

IX. For the best pen of five Ewe Lambs—Seven Sovereigns.

For the second best pen of five ditto—Five Sovereigns.

CHEVIOT BREED.

X. For the best two Tups—Ten Sovereigns.

For the second best two ditto—Seven Sovereigns.

For the third best two ditto—Five Sovereigns.

XI. For the best Shearling Tup—Seven Sovereigns.

For the second best ditto—Three Sovereigns.

XII. For the best pen of five Ewes—Seven Sovereigns.

For the second best pen of five ditto—Three Sovereigns.

XIII. For the best pen of five Gimmers—Seven Sovereigns.

For the second best pen of five ditto—Three Sovereigns.

XIV. For the best five fat Wethers, lambed in 1841—Five Sovereigns.

LEICESTER BREED.

XV. For the best Tup, not exceeding forty-five months old—Ten Sovereigns.

For the second best ditto—Five Sovereigns.

XVI. For the best pen of three Ewes of any age—Five Sovereigns.

XVII. For the best pen of three Wethers, not exceeding thirty-two months old—Three Sovereigns.

XVIII. For the best pen of Three Wether Lambs—Three Sovereigns.

XIX. For the best pen of three Tup Lambs—Three Sovereigns.

XX. For the best pen of three Ewe Lambs—Three Sovereigns.

SOUTHDOWN BREED.

XXI. For the best Tup—Fifteen Sovereigns.

For the second best ditto—Ten Sovereigns.

XXII. For the best pen of five Ewes—Ten Sovereigns.

For the second best ditto—Five Sovereigns.

XXIII. For the best three Wethers, showing most symmetry, fat, and weight—Five Sovereigns.

CROSSES.

Class XXIV. For the best pen of five Dinmonts, cross between Leicester Tup and Cheviot Ewe—Five Sovereigns.

XXV. For the best pen of five Dinmonts, cross between Leicester Tup and Black-faced Ewe—Five Sovereigns.

XXVI. For the best pen of five Dinmonts, cross between Southdown Tup and Black-faced Ewe—Five Sovereigns.

XXVII. For the best pen of five Wethers, of any cross, not exceeding four years old—Five Sovereigns.

§ IV. SWINE.

Class I. For the best Boar, large breed—Four Sovereigns.

For the second best ditto—Two Sovereigns.

II. For the best Sow, large breed, in pig or milk—Four Sovereigns.

For the second best ditto—Two Sovereigns.

III. For the best Boar, small breed—Four Sovereigns.

For the second best ditto—Two Sovereigns.

IV. For the best Sow, small breed, in pig or milk—Four Sovereigns.

For the second best ditto—Two Sovereigns.

V. For the best three Store Pigs, of the same litter, from four to nine months old—Four Sovereigns.

For the second best ditto—Two Sovereigns.

§ V. POULTRY.

Class I. For the best couple of Turkeys, of the black breed—Two Sovereigns.

For the second best ditto—One Sovereign.

II. For the best two Capon Turkeys—Two Sovereigns.

For the second best ditto—One Sovereign.

III. For the best couple of Fowls, of the mottled or speckled Dorking breed—One Sovereign.

For the second best couple of ditto—Half a Sovereign.

IV. For the best couple of Fowls of the Polish breed—One Sovereign.

For the second best ditto—Half a Sovereign.

V. For the best couple of Fowls of the Spangled Hamburgh, or old breed of Scotland—One Sovereign.

For the second best ditto—Half a Sovereign.

Class VI. For the best couple of Fowls of the Malay breed—One Sovereign.

For the second best ditto—Half a Sovereign.

VII. For the best two Capons—One Sovereign.

VIII. For the best two Poulards—One Sovereign.

IX. For the best couple of Ducks—One Sovereign.

For the second best ditto—Half a Sovereign.

Attention is directed to the Aylesbury Duck, as a breed which by many is highly esteemed.

X. For the best pair of Geese—One Sovereign.

For the second best ditto—Half a Sovereign.

Note.—The Poultry for the above Premiums must have been bred and reared in Scotland.—When the word 'Pair' or 'Couple' is used, it is understood that a male and female of each breed is to be exhibited.

XI. For the best Poultry of any description, without restriction or limitation as to the place where they have been bred or reared, a sum of Five Sovereigns for Premiums will be placed at the disposal of the Judges.

§ VI. DAIRY PRODUCE.

1. CURING BUTTER.

Class I. To the owner of any Dairy in Scotland who shall have made and cured, during the season 1844, and shall exhibit at the Show, the best quality of Butter for the Market—the quantity made and cured not being less than two cwt—Ten Sovereigns.

For the second best quality—Seven Sovereigns.

For the third best quality—Five Sovereigns.

The sample produced not to be under 14 lbs. in weight, and a declaration to be lodged with the Secretary, certified by two Members of the Society, stating the quantity made and cured, and that the sample is a fair average of the quality made and cured by the Competitor during the season 1844.

II. For the best fresh Butter, to be exhibited in samples, consisting of three Rolls of 1 lb. weight each, and by an individual from the Farm of which it is the produce—Three Sovereigns.

For the second best ditto—Two Sovereigns.
For the third best ditto—One Sovereign.

II. MAKING CHEESE.

Class III. To the person in Scotland who shall produce the best specimen of Sweet or Full Milk Cheese, made in 1844, of any variety that he shall find most profitable for the Market, the quantity not being less than 2 cwt. of 112 lb., 16 oz. to the lb.—Ten Sovereigns.
For the second best quality—Seven Sovereigns.
For the third best quality—Five Sovereigns.

IV. To the person in Scotland who shall produce the best specimen of Sweet or Full Milk Cheese, made previous to the year 1844, of any variety that he shall find most profitable for the Market, the quantity not being less than 2 cwt. of 112 lb., 16 oz. to the lb.—Ten Sovereigns.
For the second best quality—Seven Sovereigns.
For the third best quality—Five Sovereigns.

The samples to consist of two Cheeses for each variety, and a declaration to be lodged with the Secretary, certified by two Members of the Society, that the Cheeses produced are a fair average of the kind competing made by the Competitor. The quantity made to be stated.

V. To the owner of any Dairy in Scotland who shall have made for sale, during the season 1844, the best quality of Cheese from Skimmed Milk—not being less than 2 cwt.—Five Sovereigns.
For the second best quality of ditto—Three Sovereigns.

The Premiums in Class V. are offered under the same conditions as the Premiums in Classes III. and IV.

In the event of two or more lots of Butter or Cheese being deemed of equal merit, the Premiums will be awarded to the greater quantity made, and the Society's Silver Medal will be given to the unsuccessful Competitior.

§ VII. SEED WHEAT.

As the Show is to take place in the beginning of August 1844, when few or no Seeds of that year's growth can be exhibited, the Society proposes the following Premiums for Seed Wheat, to be competed for within the Corn Exchange in Glasgow, upon Wednesday the 2d of October 1844.

Class I. For the five quarters of the best quality of any named variety of White Wheat, the produce of the Counties of Lanark, Renfrew, Bute, Ayr, Dumbarton, or Argyll—Ten Sovereigns.

II. For the five quarters of the best quality of any named variety of Red Wheat, the produce of the said Counties—Ten Sovereigns.

A declaration must be lodged with the Secretary at Edinburgh, or with the Local Secretaries at Glasgow, by the party competing, on or before the 20th of September, certified by two Members of the Society, that the wheat produced is of the actual growth of one of the Districts above named.

§ VIII. EXTRA STOCK, ROOTS, SEEDS, &c.

For Extra Stock of any kind not shown for any of the above Premiums, and not exceeding, in one lot, five Cattle or ten Sheep, and for Roots, Seeds, &c., Premiums will be awarded and apportioned by the Committee and Judges, in Money, Plate, or Honorary Medals, to the amount of Fifty Sovereigns.

§ IX. IMPLEMENTS AND MACHINES.

Class I. For the best collection of Agricultural Implements and Machines, of any description, manufactured by or under the superintendence of the Exhibitor, just proportion of parts, workmanship, utility, and price, being considered;—A Premium not exceeding Fifteen Sovereigns, and not under Ten Sovereigns.

II. For any new and useful Agricultural Implement or Machine that has been satisfactorily tested in actual work, not previously exhibited in competition—A Premium not exceeding Ten Sovereigns, and not under Three Sovereigns.

III. For any Design, Model, or Drawing of any new Machine or Implement applicable to any purpose connected with Agriculture, though not tested by experiment, but which may, in the opinion of the Judges, promise to be successful in accomplishing the object intended—A Gold or Silver Medal, as may be fixed by the Judges.

IV. For any useful improvement in the construction of Subsoil Ploughs—A Premium not exceeding Seven Sovereigns, and not under Three Sovereigns.

V. For any useful improvement in the construction of the common two-horse Plough, which has for its object the lifting and turning over the greatest possible quantity of the soil in a given time, with the least resistance to the draught, and which produces, at the same

time, a fair and efficient surface for exposure or for seed—A Premium not exceeding Ten Sovereigns, and not under Five Sovereigns.

Class VI. For any useful improvement in the construction of Barn Fanners—A Premium not exceeding Ten Sovereigns, and not under Three Sovereigns.

VII. For any useful improvement in Farm-Carts and Wheels—A Premium not exceeding Ten Sovereigns, and not under Three Sovereigns.

VIII. For any useful improvement on the Thrashing Machine—A Premium not exceeding Ten Sovereigns, and not under Three Sovereigns.

IX. For the most useful improvement in the construction of any of the Implements used in the cultivation of the Turnip and Potato crops—A Premium not exceeding Eight Sovereigns, and not under Three Sovereigns.

X. For the most useful improvement in any of the utensils or machines used in Dairy husbandry—A Premium not exceeding Seven Sovereigns, and not under Two Sovereigns.

XI. For the most successful introduction of any Machine or Implement that is generally approved of in the practice of Agriculture in England or elsewhere, or a Modification of the same, and which has hitherto been but little known or employed in Scotland—A Premium not exceeding Ten Sovereigns, and not under Five Sovereigns.

XII. For a Weighing Machine, adapted to general Farm Purposes, capable of weighing Stock or Produce, dead or alive, from the weight of a Sheep to that of a loaded Cart, and which will indicate the addition of $\frac{1}{1000}$ part of the mass to be weighed—A Premium of Fifteen Sovereigns.

XIII. For any improved method, whether patented or not, of manufacturing Drain Tiles, or Pipes, whereby the price will be reduced; the tiles or pipes to possess the requisite qualities of usefulness and durability, and satisfactory evidence as to the price to be produced—A Premium not exceeding Fifteen Sovereigns, and not under Seven Sovereigns.

Note.—In the above Classes, the Premiums to be awarded will be for Implements, Machines, &c., which are approved of, and which shall be considered to possess the greatest merit of those in their respective Classes.

XIV. Besides the above, Premiums and Medals will be awarded for articles which do not come within the range of those specified, to an amount not exceeding Twenty Sovereigns.

An Implement or Machine in any collection, competing for the Premium, No. 1, will be allowed to compete for any of the Special Premiums in the other Classes.

In Classes I. and XII., the Exhibitor's name and address must be attached to the Articles; and orders must be executed at the prices named, if given during the days of the Show.

Paint is not to be used upon the wood or iron-work of the Implements or Machines exhibited, but they must be coated with transparent varnish. From this regulation may be excepted any articles shown for the purpose of exhibiting the principle of their construction. Exhibitors must be prepared, if required by the Judges, to separate the parts of Implements or Machines, and must come provided with instruments for that purpose.

GENERAL REGULATIONS FOR THE SHOW

1. The Stock must, at the date of the competition, be *bona fide* the property and in the possession of the party in whose name they are entered, and they must have been so at least from the 1st of May 1844.

2. The ages of the Stock will be calculated from the 1st of January of the year of birth. Where the precise age is known, it is to be stated.

3. Cattle fed on distillery or brewers' wash or grains are excluded from competition, except in Class 12, as that food is not generally accessible. Stock which may have received oil-cake or grain are not excluded; but where cake or grain has been used, the quantities are to be stated in the certificate.

4. Cows in competition must have had a calf, or be in calf, and Ewes must have reared Lambs in the year 1844. If desired, evidence must be produced that Stallions and Bulls, if four years old or upwards, for which Premiums may be awarded, had produce in the preceding year. The Ewes must form part of regular breeding stocks.

5. An animal having already gained a first premium at any of the Society's General Shows, is not to be shown again in competition in a class of the same denomination.

6. The stock to be shewn must be intimated by a certificate for each lot, according to the forms hereto annexed. It shall be competent to the Committee, if they see fit, to require the Exhibitor, or the person in charge of the Stock, to confirm the Certificates in the presence of a Magistrate on the day of competition. Printed Certificates, to be completed with the required particulars, and to be subscribed by the Exhibitor, may be had on application at the Society's Hall, Edinburgh, and from Mungo Campbell, Jun., Esq., Glasgow, and Mark Sprot, Esq. of Garnkirk, Secretaries to the Local Committee.

The Secretary will be at Glasgow on the 15th and 16th of July, to answer enquiries, attend to details, and to receive certificates. In the meantime, certificates may be lodged with him at Edinburgh, or with the Local Secretaries at Glasgow.

The certificates, duly completed, must be lodged with the Secretary of the Society, or transmitted, so as to reach him, at his office in Albyn Place, Edinburgh, or with the Local Secretaries at Glasgow, at the latest twenty-one days before the first day of the Show, (16th of July.) The Certificates, when lodged, are not to be communicated, except by directions of the Committee. A Competitor may show more than one lot in any Class, but not more than three. It shall not be competent to enter a lot in one Class, and to withdraw it for competition in another, except by authority of the Committee. The same lot of Stock can be entered in one Class only.

7. Besides the Stock specified in the Classes of the above list, Cattle, Horses, Sheep, and Swine, possessed of merit, may be exhibited as Extra Stock, if duly intimated by a Certificate for each lot, in a form similar to what is prescribed for the competing Classes, and lodged twenty-one days before the Competition. Stock which cannot be shown in any competing Class, may be exhibited as Extra Stock. If any lot of Fat Stock, for which a competing Class is open, is to be entered as Extra Stock, from an impression on the part of the Exhibitor that they are too young to compete in the Classes open to them, the Judges of Extra Stock are directed to notice them specially, provided they possess merit. Dairy Produce, Poultry, Implements, Seeds, Roots, Plants, &c. must also be intimated by lodging with the Secretary, at least twenty-one days before the Show, notices of the Articles, as above mentioned.

8. A responsible person must attend at the Secretary's office in Glasgow, not later than the 3d of August, to give explanations if required, to receive instructions, and orders duly signed for the admission of the Stock to the Show-ground. The person so attending must be acquainted with the various particulars required to be certified.

9. A list of the Stock and articles entered will be made up by the Secretary twenty-one days before the Show, and none will be allowed to compete which are not entered in that List.

10. All Stock and other articles entered, must be brought forward to the Competition, unless prevented by some unavoidable cause. If not so brought forward, the owner will, if a reason, satisfactory to the Chairman of the Committee, or to the Directors, is not assigned, be liable for all expenses caused by the entry, and any other course followed, which the Committee or Directors may consider proper. The Implements and Machines, Seeds, Roots, and Dairy produce, must be brought to the Show-Ground by nine o'clock in the morning of Wednesday the 7th August. The Stock must be brought to the Show-Ground, between the hours of five and seven o'clock of the morning of Thursday the 8th August, to afford time for placing them. No stock or other articles can come within the premises, without having an admission order. One servant only for each lot can be admitted, and he must continue in charge of the lot in the Show-Yard. Bulls must be secured by a ring or screw in the nose, with a chain or rope attached, otherwise they will not be admitted into the Show-Yard. There are screws for temporary use, which Competitors will find it convenient to provide for Bulls that have not been usually ringed. The Competing Stock will be distinguished by *numbers*, so that the owner's name will not be known until the Premiums are decided.

11. The arrangements for the Show will be conducted by a Committee of the Society's Members. Skilful persons will be appointed to act as Judges, who will be divided into sections, to judge of the Classes with which they are best acquainted, in order to render the inspection as short as possible, and that the public may have early access to the Show-Ground. The Judges, in forming their opinion, will particularly attend to the instructions hereto annexed.

12. A Member of the Committee, or of the Deputation of Directors, will be appointed to attend each section of the Judges. A servant, provided with tickets, upon which shall be printed the Premium awarded, will be in attendance on the Member so appointed; and as soon as a section of the Judges shall determine which animal or animals are entitled to the Prizes in their respective Classes, the Member of the Committee or Deputation of Directors shall order the servant to affix the Prize Tickets on the animals, and the Member is to be responsible for the Tickets being affixed accordingly, that the public may have the earliest opportunity to examine the points of the Prize Cattle. None of the Tickets so placed shall be removed. If any Prize Ticket be removed and affixed to an animal which has not obtained a Premium, the parties so offending shall be proceeded against as the Committee or Directors may appoint. On Thursday, the Stock shall be withdrawn, and the Show-Yard shut at four o'clock.

13. All the *Prize* Animals shall be brought to the Show-Ground by ten o'clock in the morning of the day immediately after the General Show, under penalty of the owner forfeiting the Premiums. The Deputation of the Directors will then determine if Portraits of any of the Prize Animals shall be taken for the Society's Museum, and, in the event of any being selected, the owners are required to keep them in or near the town for such a reasonable time as may be necessary to take the Portrait, under the penalty of forfeiting the Premium. The expense attending the detention, which will be limited to four days, to be paid to the owner by the Society, at a rate not exceeding 7s. 6d. per day. Those who may have Stock possessing particular merit, especially such animals as have been commended by the Judges, are invited to show them on this day, for the gratification of practical Breeders, when a favourable opportunity may be given to sell both Breeding and Fat Stock to advantage. The Premiums will be paid with the Society's General Premiums, on or after the 10th of February 1845.

14. No change can, under any circumstances, be made upon the General Regulations established by the Society for Agricultural Meetings and General Shows of Live Stock, so far as Competitors are interested, unless regularly submitted and approved at a Meeting of the Directors in Edinburgh, and duly intimated to Competitors.

His Grace the Duke of Richmond, K.G., President, and the Vice-Presidents of the Society; the Lord-Lieutenants, Vice-Lieutenants, and Conveners of the Counties of Lanark, Renfrew, Ayr, Argyll, Dumbarton, and Bute, with an adequate number of the Members of the Society, to be named at the Meetings on the 30th of April by these Counties, and by the City of Glasgow, together with the Secretaries of the Local Agricultural Associations in the said Counties, have been appointed a Committee for regulating all details connected with the Agricultural Meeting and General Show of Live Stock at Glasgow. The Earl of Eglinton and Winton, Chairman; Walter Frederick Campbell, Esq. of Islay, Deputy-Chairman; and William M. Fleming, Esq. of Barrochan, Convener of the Committee of Superintendence; Mungo Campbell, Junior, Esq. Glasgow, and Mark Sprot, Esq. of Garnkirk, Secretaries to the Committee.

FORM OF CERTIFICATE FOR FAT OXEN.

I,   near the post town of   in the county of   do certify, That my Ox (or Oxen, as the case may be) of the   breed, to be shown at the General Show of Live Stock at Glasgow, for the premium in Class   was bred by Mr.   of   , and purchased by me from   on or about   ; he was calved   , and will, at the date of the Show, be   years and   months old, and has been fed by me on   . The quantity of cake or corn he has consumed has been   . He has not at any time been fed on distillery or brewers' wash or grains. He will have to travel on foot (or by steam, or other conveyance, as the case may be)   miles, or thereby, from the place of feeding to the Show at Glasgow. He was first put up to fatten on or about the   day of

Witness my hand this   day of   1844.

(*Signature of the Exhibitor.*)

Any observations as to the animal's appearance and state of flesh when put up to feed, or other particulars which the Exhibitor may think material, and more especially the pedigree, may be subjoined to the above certificate.

FORM OF CERTIFICATE FOR CATTLE—LEAN OR BREEDING STOCK.

I,   , of   , near   , in the county of   , do certify, That my   , of the   breed, to be shown at the General Show of Live Stock

at Glasgow, for the Premium in Class , bred by , and purchased by me from on or about , and calved , will, at the date of the Show, be years and months old, and since been in my possession, food been will have to travel on foot miles or thereby, to the Show at Glasgow. Witness my hand this day of 1844.

(*Signature of the Exhibitor.*)

N.B.—Any observations with reference to other particulars, which the Exhibitor may think material, may be subjoined to the above certificate. The pedigree, when known, must also be stated.

FORM OF CERTIFICATE FOR HORSES, SHEEP, OR SWINE.

I, of , near , in the county of , do certify, That my , of the breed, to be shown at the General Show of Live Stock at Glasgow, for the Premium in Class , bred by , and purchased by me from , foaled (lambed, or pigged, as the case may be) , will, at the date of the Show, be years and months old, and since been in my possession, food been ;—will have to travel on foot miles or thereby, to the Show at Glasgow. Witness my hand this day of 1844.

(*Signature of the Exhibitor.*)

N.B.—Any observations with reference to other particulars, which the Exhibitor may think material, may be subjoined to the above certificate. The Pedigree, when known, must also be stated.

INSTRUCTIONS TO THE JUDGES.

1. The Judges will assemble on the morning of the Show, at the time and place to be appointed by the Committee. When it is intimated that the Stock is ready to be examined, the Judges will proceed to the respective Classes which have been assigned to them. Without inquiry as to the names of parties or places, they will decide upon the merits of the animals, and their awards shall make reference merely to the *numbers* which distinguish the animals. The Member of the Committee or Deputation of Directors who attends each section of the Judges will receive from the Secretary blank Reports to be completed by him, under their instructions, with the awards of the Premiums. In this Report, the *numbers* referable to the lots recommended must be distinctly written in words, and not in figures. The Judges will report not only those animals entitled to Premiums, but also the next in merit in each Class, to meet the contingency of any challenge which may be made against the Prize animals. They will also point out any animals, portraits of which they may consider should be taken for the Society's Museum. They will sign and deliver their Report, and they are not afterwards to propose any change. In the event of a difference of opinion, the majority of the Judges who have examined the Lot shall be conclusive. When the Report is delivered to the Committee, the duty of the Judges shall cease, and the Committee shall award the Premiums.

2. The Judges, in examining the Stock, will proceed on the understanding that the Committee are satisfied with the regularity of the Certificates; but if any of the Stock does not, in their opinion, come within the Regulations, or is of such a character as ought not to be exhibited, they will state their opinion to the Committee, that such course may be adopted as shall appear necessary. Should the Judges desire to have the information

communicated in the Certificates, as to the mode of feeding or other particulars, they will apply for the same to the Committee through the Secretary.

3. The Judges will have regard to the symmetry, early maturity, purity, size, and general qualities characteristic of the breeds of which they judge. They will make due allowance for age, feeding, and other circumstances bearing on the character and condition of the animals. They will not give encouragement for over-fed animals. They will not award Premiums for Bulls, Cows, or Heifers which shall appear to have been fattened for the butcher, the object being to have superior animals of these descriptions for breeding. In no case shall a Premium be adjudged, unless the Judges shall deem the animals to have sufficient merit, more especially if only one lot is presented for any of the Premiums.

THE VETERINARY COLLEGE.

This Establishment is conducted under the superintendence of Professor Dick, Veterinary Surgeon, the Lecturer appointed by the Society Students receive instruction in the anatomy and diseases of the horse and other domestic animals, in the best system of treatment and cure, in stable management, and in the most approved and scientific modes of shoeing. The Students are sent to the College by Local Agricultural Associations, or attend on their own account. The hour of lecture is accommodated to the convenience of Students attending the Agricultural and other classes in the University. Those Students who attend two courses, and are afterwards found qualified at the Annual Examination by the Committee of Medical Examinators, receive Diplomas, Graduates of the College are eligible for Veterinary Surgeons in the Army and East India Company's Service.

Professor Dick occasionally delivers a popular course of Lectures to a class of Gentlemen. It may be also observed, that several of the principal Lecturers in different branches of Medical Science, have for some years given free admission to their classes to those Veterinary Students who intend to practice.

The Lectures and Demonstrations for the Session 1844-45 will be commenced in November next, at the Lecture-room in Clyde Street, Edinburgh.

By order of the Directors.

CHARLES GORDON, *Secretary.*

PREMIUMS

OFFERED BY

THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND,

FOR PROMOTING AGRICULTURE AND INTERNAL IMPROVEMENT IN SCOTLAND,

IN

1845.

CONTENTS.

CONTENTS.

PRELIMINARY NOTICE.

The business of The Highland and Agricultural Society of Scotland is conducted by a President, Four Vice-Presidents, Thirty Ordinary, and Ten Extraordinary Directors, a Treasurer, an Honorary Secretary, and a Secretary, to which last all communications are addressed. The Ordinary Directors are subdivided into Committees for the despatch of business, assisted occasionally by those Ordinary Members most conversant with the subjects to be considered, or with the duties to be discharged. The report of each Committee is brought before the Directors collectively for farther procedure, and their proceedings are again submitted for approbation to a half-yearly General Meeting of the Society. One of the General Meetings is, by the Charter, appointed to be holden on the second Tuesday of January; the other on such day in the months of June or July as the Directors may fix. New Members are admitted at either of these General Meetings by ballot. They pay a small annual contribution of L.1 : 3 : 6, or, in their option, and in full of all future claims, a life subscription of Twelve Guineas. The Annual Subscription is payable in advance, and is expected to be so paid or remitted, by the Members who are liable in it, without expense to the Society. All Meetings of Directors, or Committees, are open; and at these any member may attend and deliver his opinion on the subjects under consideration, though, in cases of division, the Directors or Members of the Committees only are entitled to vote. Members have access to the Society's Library, which is annually increasing by the purchase or donation of books connected with the purposes of the Institution.

When the Highland and Agricultural Society of Scotland was instituted in the year 1784, the object chiefly contemplated was the improvement of the Highlands, and hence the name—The Highland Society of Scotland—which it then assumed. But the great increase in the number of its Members since that time, the happy management of its funds, and the change in the general state of the country, have long enabled it to extend the design of its first institution, and direct attention to every part of North Britain where industry might be excited or the useful arts improved. In accordance with this extension of the purposes of its institution, the Society, in its Supplementary Charter, has been named The Highland and Agricultural Society of Scotland.

The Society has, neither by its Charters of Incorporation, nor by its practice, been limited in its patronage to any one department of industry; but it has regarded as the fitting objects of encouragement, every application of useful labour which might tend to the general good. But, although its patronage be thus extended as regards its objects, circumstances have arisen to modify, in some cases, the application of it. The establishment of certain Boards, for the encouragement of the Herring Fishery, and the like, has induced the Society to restrict its original views, and to devote its attention, and apply its funds, in a more special manner, to other objects, and chiefly to Agricultural and Rural Economy in their various branches.

In fulfilment of its purposes, the Society is every year accustomed to offer and award a variety of Premiums, as the means of eliciting and diffusing knowledge, as incitements to industry, or as the rewards for useful undertakings. These relate to every subject which may be supposed to fall within the plan of the Institution:—such are, the Improvement of Waste Lands by Tillage, by Irrigation, or by Draining, the development of the Mineral Products of the country, the extension of Plantations, as the objects of ultimate profit,

or of present embellishment and shelter,—the improvement of the breeds of Live Stock, and of the qualities of Wool,—the encouragement of certain domestic manufactures,—and, not the least in interest and importance, the awakening the industry of the Lower Ranks to such pursuits as shall promote their content, by ameliorating their condition. A Mechanical Department exists for rewarding the original invention or subsequent improvement of all machines and implements for Agricultural purposes, the construction of those for other branches of Rural Economy, and of some for domestic convenience. Models of these are received and preserved in the Society's Museum; and descriptions of all such as merit attention are as speedily as possible conveyed to the public.

Although certain subjects be thus selected as the objects of experiment or discussion, the patronage of the Society is not restricted to these objects. Its purposes being the promotion of general industry and improvement, it receives with favour every beneficial communication, and every statement of facts which may admit of an useful application.

The papers of the Society are printed periodically in "THE JOURNAL OF AGRICULTURE, AND THE TRANSACTIONS OF THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND," published by Messrs. BLACKWOOD, 45, George Street, Edinburgh, and 22, Pall Mall, London.

The Society is prepared to receive with attention all written communications, in the form of Essays, Reports, Notices of Experiments, and the like, which may be presented to it by LOCAL ASSOCIATIONS. Such communications, if approved of by the Society, will be inserted in the Transactions; and opportunity will be given to the Authors or Associations of obtaining separate copies from the types for circulation in the district.

All communications relating to Premiums, as well as Papers or Reports for publication in the Transactions of the Society, and other subjects for the consideration of the Directors, are to be addressed to SIR CHARLES GORDON, the Secretary of the Society, at the Society's Hall, Albyn Place, Edinburgh.

NOTICE TO CANDIDATES,

AND GENERAL RULES FOR COMPETITION.

When subjects are specially selected for competition, it is always to be understood, 1st, That however concisely the subjects themselves be announced, ample information is required concerning them—2d, That this information shall be founded on experience or observation, and not on simple references and quotations from books—3d, That it shall be digested as methodically as possible,—and 4th, That Drawings, Specimens, or Models, adapted to a defined scale (3 inches to the foot if convenient), shall accompany writings requiring them for illustration.

Certain conditions are annexed to each of the various subjects of competition, as detailed in the List of Premiums; and these are rigidly enforced by the Society, as the only means of insuring regularity in the conduct of the business, and of distributing exact justice among the competitors.

In all Essays for Competition for Premiums offered, it is expected that when facts not generally known are stated, they will be authenticated by proper references. Competitors in Essays and Reports are required to quote, or state distinctly on the top of the first page of their paper, the *number* and *title* of the subject or Premium for which they compete. They will not communicate their names, but shall transmit along with the Essays a sealed note, con-

taining their names and addresses, and inscribed on the back with some distinguishing motto or device, which shall also be inscribed on the Essay. When this regulation is neglected, such Essay shall not be received in competition. If the Essayist has formerly gained a Premium from the Society for a Paper communicated by him, it is recommended, that his subsequent Essay shall be written in a different hand from that of the former successful Paper. Surveys, Essays, or Reports of considerable length, must be bound, or inserted in a book, to facilitate their perusal.

None of the sealed notes, except those that bear the distinguishing motto or device of the Essays found entitled to Premiums, will be opened, and the sealed note will not, in any instance, be opened, without the consent of the author, unless a sum equal to, at least, one-half of the Premium offered shall have been adjudged. But should no application be made for the paper on or before the 1st of March in each year, it will be held as belonging to the Society on the terms proposed. Such Essays as are not found entitled to any Premium will, with the sealed notes, be returned to the authors if required. The Society is to be at liberty to publish the Essays, or extracts from them, for which the Premium, or part of it, shall be awarded.

Candidates are requested to observe, that, in any instance, when Essays, Reports, or Certificates, are unsatisfactory, the Society is not bound to give the reward offered; and that, in certain cases, power is reserved of giving such part only of a Premium as the claim may be adjudged to deserve; but competitors may feel assured, that the Directors will always be inclined to judge liberally of their several claims.

Essays, Reports, or Communications, on subjects for which Premiums have in former years been offered, will still be received, although the subjects may now be discontinued on the List, and Honorary awards will be voted, when the communications appear to merit them.

Essays and Reports, for which no Premiums have been awarded, must, if desired to be returned, be called for within one year from the date of Competition, otherwise the Society will not be responsible for the papers.

Competitors will understand it as a condition having reference to every Premium and Reward offered by the Society, that the decisions of its Committees and Board of Directors, as confirmed by the Society, are to be final and conclusive, and that it shall not be competent to raise any question or appeal touching such decisions before any other tribunal.

In Reports of experiments relating to the Improvement or Management of Land, it is expected that the expenses shall be accurately detailed.

In all Premiums offered, having reference to Weight or Measure, the New or Imperial Standards are alone to be understood as referred to; and Competitors are required to state their calculations according to these, the only legal standards, otherwise the claim will not be entertained.

When the Premiums are awarded in Medals or Plate, the Society will, in such cases as the Directors may see proper, allow them to be paid in money, on the application of the successful Candidates.

The Premiums awarded by the Society are payable after the 10th February, for the preceding year. Orders payable at the Royal Bank of Scotland, are issued of that date, by the Directors, in name of the parties in whose favour the Premiums have been awarded. The orders will be delivered at the Society's Hall, upon the receipts of the parties to whom the Premiums have been adjudged being presented; or the parties may transmit, through any Bank, stamped receipts, or negotiate bills, addressed to the Treasurer or Secretary, if done without expense to the Society. The receipt or bill must specify distinctly the Premium in discharge of which it is sent.

Parties entitled to *Plate* or *Medals*, will, by themselves, or some person having their authority, apply at the Society's Hall for an order on the Society's Jeweller or Medalist.

ESTABLISHMENT FOR 1845.

PRESIDENT.

His Grace JAMES DUKE of MONTROSE.

VICE-PRESIDENTS.

1844. The Most Honourable JOHN, MARQUIS of QUEENSBERRY.
1844. The Right Honourable CHARLES, EARL of CATHCART.
1845. The Right Honourable ARCHIBALD, EARL of EGLINTON and WINTON.
1845. The Right Honourable DUNBAR JAMES, EARL of SELKIRK.

EXTRAORDINARY DIRECTORS.

The Most Noble GEORGE, MARQUIS of LORNE.
The Right Honourable JAMES, EARL of GLASGOW.
The Right Honourable ROBERT, LORD BELHAVEN.
The Right Honourable The LORD PROVOST of GLASGOW.
Sir DAVID HUNTER BLAIR of Dunskey, Bart.
ALEXANDER MURRAY, Esq. of Broughton, M.P.
MARMADUKE MAXWELL, Esq. of Terregles.
JOHN MACKIE, Esq. of Bargally, Convener of the Stewartry of Kirkcudbright.
STAIR H. STEWART, Esq. of Physgill, Convener of the County of Wigton.

Sir John Stuart Forbes of Pitsligo and Fettercairn, Bart., *Treasurer.*
John James Hope Johnstone, Esq. of Annandale, M.P., *Honorary Secretary.*
Sir Charles Gordon of Drimnin, Knt., *Secretary.*
Claud Russell, Esq. *Accountant.*
The Rev. James Grant, D.D., St. Mary's Church, Edinburgh, *Chaplain.*
Mr. James Mackay, *Goldsmith and Jeweller.*
Mr. Alexander Kirkwood, *Practical Medallist.*
Mr. Charles Lawson, *Nursery and Seedsman.*
Mr. William Dick, *Professor at the Veterinary College.*

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According to Priority in Date of Election.

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The Argyll Naval Fund, . .	ALEXANDER LAMONT, Esq. of Knockdow.

THE SOCIETY'S MUSEUM, GEORGE IV. BRIDGE.

The Right Honourable the EARL of CATHCART, K.C.B.,
Chairman of the Committee of Superintendence.

CHARLES LAWSON, *Conservator.* GEORGE W. YOUNG, *Assistant.*
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HELD AT THE MUSEUM.

Chairman—The Right Hon. the EARL of ROSEBERY, K.T.
Deputy-Chairmen—ROBERT GRAHAM, Esq. of Balgowan; JAMES MAITLAND HOG, Esq. of Newliston; and Sir GEORGE GRANT SUTTIE of Prestongrange, Bart.
Clerk—HENRY STEPHENS.

PREMIUMS.

SOCIETY'S HALL, ALBYN PLACE,
EDINBURGH, *10th February* 1845.

THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND offers the following PREMIUMS for Competition in 1845, and following years:—

CLASS I.

ESSAYS AND REPORTS

ON SUBJECTS CONNECTED WITH THE SCIENCE AND PRACTICE OF AGRICULTURE.

1. EXPERIMENTS ON THE EFFECTS ATTENDING THE IMMEDIATE APPLICATION, AND THE CONTINUED RESULTS OF CERTAIN SPECIAL MANURES.

Fifty Sovereigns will be awarded in such proportions as the Directors may see proper for approved Reports as aftermentioned, viz.:—

1. For a report of experiments made with different manures, both *separately* and also *mixed in certain proportions*. Each experiment to be made *double*,—that is, on two separate portions of land of not less than one-eighth of an acre.

The substances employed to be Guano, Nitrate of Soda, Nitrate of Potash, Sulphate of Soda, Sulphate of Magnesia, Sal Ammonia, Sulphate of Ammonia, Carbonate of Soda, Pearl Ash, Kelp, and Bones, or mixtures of these in specified proportions. The Ammoniacal liquor of Gas Works should also be tried; and it is particularly recommended that the refuse of any of our Manufactories, such as

the Prussiate of Potash, and the animal refuse of Sugar Works, should be collected and experimented upon.

It is of importance, that the effects of such substances upon the Crops of the second, third, and fourth years should be carefully observed and reported; and though it is not indispensable that a Report on this division of the premiums, when sent in, should contain observations made for more than one year, yet a higher value will be placed upon those in which such observations shall be distinctly and carefully embodied.

The substances above mentioned, and any others of known composition which the experimenters may select, are to be tried after the following manner: A series of square or oblong portions, not less than one-eighth part of an acre each, are to be marked off in the field, and the different substances applied to the crop or seed upon each plot. Thus, if the substances to be experimented on be Farm-yard Manure, Guano, Bone Dust, Sulphate of Ammonia, Kelp, and Nitrate of Soda, they may be arranged as under, two plots for each.

In regard to the quantity of the several substances which ought to be laid on per acre, the Society considers it desirable that separate experiments should be made upon different quantities of each substance; for example, with kelp, the double set of experiments might be arranged thus:

Kelp 1 cwt. per acre.	2 cwt.	3 cwt.	4 cwt.	5 cwt.	6 cwt.
6 cwt.	5 cwt.	4 cwt.	3 cwt.	2 cwt.	1 cwt.

or different proportions of two or more substances may be contrasted with each other on the same field; thus:

Nitrate of Soda, 1 cwt.	Sulphate of Ammonia, 1½ cwt.	Nitrate of Soda 2 cwt.	Sulphate of Ammonia, 1 cwt.	Nitrate of Soda, 1½ cwt.	Sulphate of Ammonia, 2 cwt.
Sulphate of Ammonia, 1 cwt.	Nitrate of Soda, 1½ cwt.	Sulphate of Ammonia, 2 cwt.	Nitrate of Soda, 1 cwt.	Sulphate of Ammonia, 1½ cwt.	Nitrate of Soda, 2 cwt.

The substances applied may be used either alone, or in addition to the whole or one-half of the usual dressing of farm-yard manure, or in any other way which the experimenter may think most likely to lead to important results.

As to mixtures, the Society considers mixtures of several substances as a more natural and profitable mode of applying them. It is, therefore, strongly recommended that experiments with mixtures of the substances above named, should form a prominent part in the new trials they are desirous to encourage. The proportions of the several substances which are mixed must in all cases be stated.

As the object of the Society, in offering these Premiums, is to obtain results which will be as valuable to the science as to the practice of agriculture, they beg it particularly to be understood, that while the number of the experiments will be taken into account, the preference will be given to those which have been performed with the greatest accuracy. The value of the experiments will be enhanced, if accompanied with an analysis or minute description of the soil on which they are made, and means of proving the purity of the manures which were used.

The quantity by weight and cost of the manures employed (the cost, including carriage, and every other expense), as well as the quantity and quality of the crop produced by each, must be accurately ascertained and reported, with the nature and qualities of the soil, its exposure,—if drained,—and such other particulars and observations as the Reporter may deem deserving of attention.

The general conclusions and remarks which the reporters may deduce from the results of their experiments, are to be drawn up separately from the Tables, and following immediately their respective series of experiments; and in every instance it is to be hoped that these shall be as complete as the circumstances and opportunities for observation will admit.

Competitors must, along with their reports, transmit, if required, half a pound weight of the soil, collected prior to the commencement of the experiment, and the same quantity of each kind of manure employed. Reports to be lodged on or before the 10th of November 1845, under the conditions on pages 493 and 494. The number of the Premiums to be awarded will be regulated by the value of the papers received.

The Society earnestly requests the attention of landed proprietors to this very important subject, and considers that much good might

result by their either instituting experiments themselves, or inducing such of their tenants to do so, as they consider qualified to undertake them.

As it is the intention of the Society to make public the practical result of these experiments, they earnestly solicit from all quarters reports of carefully conducted experiments, however small they may be. Those who have no intention to compete for the Premiums, may yet obtain results which the Society would gladly record in their Transactions.

2. The Society, viewing the very great importance of substantiating, by actual observation and experience, the effects which Guano and other Special Manures exert on the soil for a certain number of years after their application, offers a Premium for the best Report on this subject, to be given in 1845, having reference to the experience of two or more preceding seasons. This Premium to be continued in 1846. It is intended chiefly for those Competitors who experimented and reported so successfully for the Premiums offered for Experiments with certain Special Manures in the two last years' printed lists; but it is open to others who may have followed the same, or similar enquiries. In all cases, the subsequent produce of the land which had received the Special Manure must be noted carefully by weight or measure, and compared with an equal portion of land that had received no Special Manure.

Blank tables for reporting the results of the Experiments in either of the divisions of this subject, will be supplied on application at the Society's Hall, under signature of the motto intended to be adopted by the Competitor. Examples of these tables are annexed.

Reports to be lodged on or before 10th November 1845, under the conditions on pages 493 and 494.

2. FEEDING OF STOCK.

It is required to ascertain, by direct experiment, the actual addition of weight to *growing* and to *fattening* stock respectively, by the use of different kinds of food, as well as the exact effect of weighed quantities of food of different kinds, upon the quantity and quality of milk, in full grown milk cows *in calf and not in calf*, and the Society offers a Premium of Twenty Sovereigns, or plate of that value, for the best Series of Experiments having this object

in view, either in regard to growing, full grown, and fattening Stock, or to Dairy Cows.

The attention of the experimenter will be drawn to the effects of Turnips, Carrot, Beet, Potatoes, or other roots, as well as to that of Beans, Oats, Barley, and Oil Cake, and to the opinion that warmth is equal to a certain amount, or causes a certain saving of food.

Before commencing the comparative experiments, the animals must be fed on equal quantities of the same kinds of food for some weeks previously.

The animals tried against each other should be, as nearly as possible, of the same age, weight, condition, maturity, and purity of breed. Different breeds may be compared, and this will form an interesting experiment of itself.

The animals are to be treated, in every respect, alike. The food and drink to be regularly weighed and measured, and samples of the food (when this can be done) carefully analysed. The live and, if killed, the dead weights of the animals, at the close of the experiment, should be ascertained, and the quantity of tallow which they yield.

Reports to be lodged by the 10th of November 1845, under the conditions on pages 493 and 494.

3. RADICAL EXCRETION OF PLANTS.

Twenty Sovereigns, or Plate of that value, will be given for the best and approved Essay on the Radical Excretion of different Plants, or the various substances discharged from their Roots. It is desirable to examine the subject physiologically as well as chemically, and to ascertain the existence, or otherwise, of a power of excreting various noxious substances previously absorbed, as well as of the supposed natural excretions. It will also be desirable to contrast, and endeavour to explain, the well-known fact of certain species being crowded together for many centuries, as in native forests, and yet thriving, with the equally well-known fact of the degeneration of other species, as wheat, when cultivated for even a few years upon the same spot.

NOTE.—Decandolle, Macaire, and others, from various experiments, have been led to suppose that different excretions are discharged from the roots of plants, which may probably account for their effects in deteriorating the soil for the production of the same species. The Essays are expected to give the result of original experiments, determining the fact whether or not such excretions occur; and, if they do, to ascertain the chemical nature of the matter excreted from different plants, more especially the cultivated Gramineæ, Leguminose, and Cruciferæ.

Essays to be lodged on or before the 10th November 1845, under the conditions on pages 493 and 494.

4. ANALYSIS OF OATS.

Little is yet known of the true composition of oats, either of their organic or of their inorganic parts. The nature of the organic parts, for example, is believed to vary with the kind of soil in which the oat is grown—strong land, light land, and peaty soils, each growing its own peculiar samples from the same seed. The kind of manure and the season cause similar differences, which become more marked still, when different varieties of oats are compared with one another. Again, the inorganic part of the oat varies with the same circumstances of soil, manure, climate, and variety of seed; but it is not known to what extent it varies, either as to quantity or quality.

The Society offers a premium of Fifty Sovereigns for the analytical examination of the grain of oat, by which the greatest number of the above points may be ascertained.

The object of the inquiry is to throw light upon the general value of the oat, and of its different varieties, as a food for man or beast; and upon the mode of culture which in different districts ought to be adopted, in order to raise this or that quality or variety.

Reports, containing the mode and the details of the analysis, to be lodged on or before the 10th of November 1845, under the conditions on pages 493 and 494.

5. ON RAISING IMPROVED VARIETIES OF AGRICULTURAL PLANTS.

For an approved Report, founded on actual experiment, detailing the means which may have been successfully employed by the Reporter for obtaining new and superior varieties, or improved subvarieties, of the different cultivated Grains and Grasses, Clovers, Beans, Peas, Turnips, Potatoes, or other Agricultural Plants, either by minute attention to the selection of the Seed, by hybridation, or such other means as may have been found efficacious—The Gold Medal, or Plate of the same value.

It is necessary that the varieties and subvarieties reported upon shall have been proved capable of reproduction from seed, and also that the relation they bear to others, or well known sorts, shall be stated.

The Reporter is farther requested to mention the effects that he may have observed in different soils, manures, &c., to produce on the plants forming the subjects of report, and how far he may have ascertained such effects to be lasting.

Note.—Should any improved variety reported upon be the result of direct experiment by cross impregnation, involving considerable expense and long-continued attention, a higher Premium will be awarded.

Reports to be lodged on or before the 10th of November 1845, under the conditions on pages 493 and 494.

6. ON THE CULTIVATION OF RED CLOVER.

For an approved Report on the best mode of managing Lands which have become sick or tired (as it is termed) of common Red Clover, *Trifolium pratense*, so as to restore their capability of properly yielding that crop for hay, &c., without altering the generally practised system of rotation—The Gold Medal, or Ten Sovereigns.

Reports to be lodged on or before the 10th of November 1845, under the conditions on pages 493 and 494.

7. INFLUENCE OF PLANTS ON DAIRY PRODUCE.

For an approved Essay or Report on the Influence of Plants taken as Food, on the taste, flavour, or quality of Milk, Butter, Cheese, or other Dairy produce—Ten Sovereigns, or Plate of that value.

Note.—It has been long known that the milk produced from particular pastures during certain months is deteriorated, and that the Butter and Cheese made from it are imperfect in flavour and in quality, so as sometimes to be unfit for use. This effect is supposed to arise from certain plants growing (and during these months flourishing) in the pastures; and it is to ascertain these, and their effects, that the above premium is offered. It is desired that the effects on the Milk, &c., from the eating of such supposed noxious plants, shall be stated from experiment; and that dried specimens of the plants shall accompany the Essay. The particular seasons or months such plants are in their highest vigour should also be mentioned, and the best manner of extirpating them.

Essays or Reports to be lodged on or before the 10th November 1845, under the conditions on pages 493 and 494.

8. REPORTS ON IRRIGATION.

The Gold Medal, or a Piece of Plate of the same value, will be given for the most approved account of the management of Water Meadows, founded on actual experiment within three years preceding the date of the Essay.

The experiments must be made on not less than five acres, whether detached or otherwise, and a description to be given of the rills or streams employed, and of the quality of the water, and of the manner of collecting and applying it, also an account of the land prior to the introduction of irrigation upon it, and of its estimated value at that period, and at the time when the Report is made; certified statements to be furnished of the quality of grass, if any, cut green in the spring, and the quantity and quality of the hay and aftermath produced upon the portion reported on, and the kind of stock, if any, which has been allowed to depasture it.

The Essays, accompanied by specimen of the hay produced that season, to be lodged on or before the 10th November 1845, under the conditions on pages 493 and 494.

9. CONSTRUCTION OF TANKS.

For a Report upon the most approved and most economical method of constructing Tanks for collecting liquid manure from stables, byres, and pigstyes, suitable to ordinary farm-steadings; and also on the best means of draining off from the dung-hill the liquid manure into the Tank—Ten Sovereigns.

Competitors to state the most eligible materials for the purpose, the expense, and the form and proper dimensions in proportion to the number of cattle, &c., the best mode of drawing off the contents and of applying it to the soil.

Reports to be lodged on or before the 10th November 1845, under the conditions on pages 493 and 494.

10. POTATO BLOSSOMS.

As great diversity of opinion prevails regarding the advantage gained by picking the blossoms from the stems of potatoes, instead of allowing the germs to ripen into seed apples, the medium Gold Medal will be given for the most approved Report of trials made with different varieties of potatoes, quality as well as quantity to be taken into account.

The trials to be made on portions of not less than a quarter of an acre each, care being taken in removing the flowers that the stems are not injured.

The Reports to be lodged by 10th November 1845, under the conditions on pages 493 and 494.

11. ALLOTMENT SYSTEM.

For the best Essay on the "*Allotment System*" more particularly with reference to its practical operation in any specified localities in England or Scotland—Twenty Sovereigns, or Plate of that value.

NOTE.—In announcing this premium at the request of several members of the Society, the Directors desire it to be understood that they do not intend by doing so to indicate an opinion on one side or the other, as to the comparative advantages or disadvantages of the system. They are only desirous of calling attention to the subject, which is unquestionably one of much importance, and of affording to the Society and the public the means of arriving at such a conclusion as experience may warrant.

Essays to be lodged on or before the 10th November 1845, under the conditions on pages 493 and 494.

12. KELP.

For the best Report on the most economical and simple process by which Iodine, and the valuable salts which accompany it, can be extracted from Kelp or Sea Weed, especially as fitted to be carried on by the inhabitants of the Northern and Western Highlands and Islands of Scotland—The Gold Medal or Ten Sovereigns.

NOTE.—From the increased consumption and rise in price of Iodine, which have lately taken place, the Society has been induced to offer this premium ; and it is suggested, that as the principal salts contained in Kelp, viz. carbonate of soda, chloride of potassium, and the iodide of sodium, may be separated from each other by the simple process of lixiviation and crystalization, it might be possible to make use of one heap of sea weed as the fuel wherewith to evaporate and crystalize the soluble salts produced by the combustion of a preceding one. Competitors may suggest any other simple and economical process, which would admit of practical application on the large scale, by the Kelp-burners of Scotland and the Northern and Western Isles. The Essays to contain a full account of the experiments made by the Competitors, with a description of the apparatus employed, and an estimate of the whole expense and the profits likely to result from the proposed method.

Intending Competitors are referred to an Essay on Kelp by Dr. Fyfe, in the sixth volume of the Society's Transactions.

Essays to be lodged on or before the 10th day of November 1845 under the conditions on pages 493 and 494.

13. DISEASE IN POTATOES.

The Potato Crop, which is of such importance in this country, having become very generally infected with disease, the Society is desirous, if possible, of ascertaining whether or not by the aid of

chemical analysis, any light can be thrown upon the cause of the disease, and upon the remedy to be applied.

A premium of Fifty Sovereigns is therefore offered for the best and approved analysis of sound and unsound Potatoes, and of the soils on which they grew. The analysis of the several varieties of Potato, to embrace both their organic and inorganic constituents. The details of the experimental researches, which will include Potatoes both at taking up and at seed time, and the method of analysis adopted, to be given in the Essay, which is to be lodged on or before the 10th November 1846, under the conditions on pages 493 and 494.

14. ON THE NUTRITIVE PROPERTIES OF TURNIPS RAISED WITH DIFFERENT MANURES.

With the view of testing the comparative feeding properties of Turnips grown with guano and with farm-yard manure, a Premium of Twenty Sovereigns will be given for the most approved Report on the progressive improvement and increase in weight, (during a period of at least four months) of three lots of cattle, of not fewer than four in each lot, fed on turnips and straw, or turnips and hay, in the following manner:

1. Four fed on turnips grown with guano alone.
2. Four fed on turnips grown with farm-yard manure alone.
3. Four fed on turnips grown with one-half guano and one-half farm-yard manure.

The animals selected, to be as nearly as possible of the same age, weight, condition, and breed, and to be treated in a similar manner in every respect.

The live weights of the animals to be ascertained before they are put up to feed as well as at the close of the experiment, and if the animals are slaughtered, the dead weight and quantity of tallow which they yield respectively.

The turnips grown with the different manures to be on land of equal quality and in equal condition, and the quantity supplied to each lot to be weighed.

Reports to be lodged by 10th November 1846, under the conditions on pages 493 and 494.

15. TUSSAC GRASS.

The medium Gold Medal will be given for the most approved report, founded upon actual experience, on the cultivation in this

country, of the Tussac Grass, *Dactylis cæspitosa*—seeds of this valuable grass having been lately introduced into Scotland from the Falkland Islands, where it is said to be found growing in great luxuriance, chiefly on peaty soils, within the influence of the sea. It is also said to grow on sandy soils under the same influence, and where the climate is similar to that of Great Britain.

This Premium is offered in order that the result of experiments made may be publicly known, and to ascertain if its extended cultivation in this country would be beneficial.

Parties who have received portions of the parcels of seed transmitted by the Colonial Secretary are expected to report on the results of their experiments, including all the particulars regarding them, whether successful or not.

Reports to be lodged on or before the 10th of November 1846, under the conditions on pages 493 and 494.

16. SPADE AND FORK HUSBANDRY.

The process of delving and subsoiling, by the joint-operation of the spade and fork, having attracted considerable attention in the experimental field for the trial of implements, in connection with the General Show at Glasgow in 1844, it is thought desirable to ascertain, with as much precision as practicable, the uses and advantages of those implements, when employed conjointly, in husbandry; and, for an approved report on the subject, the Society's Gold, or Medium Gold Medal, according to the merits of the communication, will be awarded.

NOTE.—The Report must contain a description of the Implements, with measurements of their principal parts, and the cost of the whole. It must describe the purposes for which they are employed, the mode of using them, the circumstances in which they are considered to be particularly applicable, whether as respects the land to be worked, or the parties by whom it is cultivated, the advantages which may be held to belong to them in comparison with other Instruments for accomplishing the same objects, and the plan deemed most eligible for insuring the uniform sufficiency of the work performed. It must further state the expense of tillage by them per acre on different soils, the depth to which the ground, where no impervious stratum occurs, can be conveniently penetrated by them, the average quantity of work executed by them per day, when two men are employed, the effect of their use upon the produce of land, and such other particulars as may be deemed worthy of notice in illustration of the purposes to which they may be applied, or the benefits to be derived from them.

Reports to be lodged on or before the 10th day of November 1846, under the conditions on pages 493 and 494.

17. ON THE ADVANTAGES OF DIBBLING IN SOWING.

For a Report, founded on actual experiment or observation, to ascertain and point out the advantages of sowing grain by the process of Dibbling—The Gold Medal or Ten Sovereigns.

Reports to be lodged by the 10th of November 1846, under the conditions on pages 493 and 494.

18. ELECTRO CULTURE.

Thirty Sovereigns will be given for the best Essay upon the Application of Galvanism or Electricity to Cultivation, in reference to the statements of R. D. Forster, Esq., M.D., Findrassie House, near Elgin, hereto subjoined, or to any others of the same nature.

No Essay to extend, when printed, to more than will fill ten pages of the size of the Quarterly Journal of Agriculture, unless it be accompanied with accurate experiments and results. Essays so accompanied to be preferred, *cæteris paribus.*

Competition will be open to Essays in the French, German, and Italian languages, as well as to Essays in the English language.

Essays to be lodged on or before the 10th November 1846, under the conditions on pages 493 and 494.

NOTE.—This Premium is proposed on the recommendation of James Adam Gordon, Esq. of Knockespock, who has placed the sum offered at the disposal of the Society for the specific purpose indicated.

STATEMENT ABOVE REFERRED TO.

"Mr. Forster, with a practical liberality which marked him a true agriculturist, was kind enough to write an account of the subject, which was the novel and surprising one of the influence of electricity and galvanism on the growth of plants as applicable to agriculture. Many years since Mr. Forster read in the *Gardener's Gazette* the account of an experiment, which mainly consisted of causing a constant flow or supply of electricity (to be afforded by a common electrical machine) to proceed from a summer or garden house, and which was diffused by wire to a fixed portion of the surrounding ground; and the effect was (as reported) that vegetation did not cease in the winter on the spot under the influence of this wonderful power; and that what snow fell during the continuance of the experiment never remained, as it did on the rest of the garden ground. This impressed Mr. Forster very much, and induced him to place a small galvanic battery in action on a grass-plot; and although the power from it was very small, still the effect produced fully confirmed the previous experiment. This, and other facts which Mr. Forster collected, led him to think that the electricity of the atmosphere (a constant current of which was found to proceed from east to west over the whole of this earth's surface) might, by some arrangement, be usefully employed in agriculture; for Mr. Crosse, of Taunton, had long since proved that the free electricity of the air might be easily collected by wire suspended on poles of wood at many feet from the earth's surface, the direction of wire being due north and south by the

compass; and many very interesting and important facts and experiments had been recorded by Mr. Crosse, and mainly collected from a careful observance of the electricity proceeding from the suspended wire. Mr. Forster next placed two poles four feet high in his front lawn, which had been recently laid down with chevalier barley and grass (after draining and subsoil ploughing it), and over those poles, which were due north and south of each other, he stretched a common piece of iron wire, fixing the two ends of it to stout wooden pins, driven in close to the earth, and on the edge of the plot of eight English poles, and around the edges, which were straight lines, he sunk about two or three inches beneath the earth two wires of equal length, the ends of which were fixed and in contact with the two ends of the suspended wire, which were meant not to be too tight, for its contraction in cold nights would break it in two, or pull away the fixtures, and thus defeat the object. Mr. Forster formed two of these plots for experiment, measuring eight square poles each; and then proceeded to criticise his work, and to do so accurately sought the aid of "Noad's Popular Lectures on Electricity and Galvanism," and almost the first half-hour's perusal showed him that there was such an error in one part of his plan as would effectually defeat his intention. This was, that the point of a blade of grass or young corn-plant has the most extraordinary faculty or power of attracting or appropriating to itself all the free electricity present at four times the distance that the finest point of metal would or could. So that when the points of the barley plants should reach one foot high all the electricity that the suspended wire might before that have collected and conveyed through the buried wire to the roots of the plants would be abstracted by the points of the barley, and thus the suspended wire getting nothing from the air could not, of course, supply anything, by which all the induced electrical influence would cease. Mr. Forster, therefore, next day placed poles eleven feet high above the surface with wires, &c., exactly the same, except that the space surrounded by the buried wire was twenty-four poles English measure. All the results are yet imperfectly known, but these were evident. The barley plants on the two smaller plots (of eight poles each) soon became darker in colour, and grew faster until they had attained to about a foot in height; the darker green colour then gradually disappeared, and at the end of a fortnight after there was no perceptible difference but in the height of the young barley plants, and even this ceased to be very apparent as the crop advanced. When the barley of the larger or twenty-four poles plot was six inches high, it assumed the same lively dark green, and grew faster than the surrounding unelectrified barley plant, and this difference it maintained up to the last, except that the colour of course in time became yellow, and it was curious that this change occurred later than in the rest of the crop. The number of stooks or shocks was also greater, and each larger when reaped, the ears from one grain of seed were more numerous and longer, the corn also was larger and harder. To make assurance doubly sure, Mr. Forster fixed to the short four feet poles of one of the smaller plots pieces of dry pine wood eight feet high, and suspended two wires to them, one at that elevation and another a foot lower down, and was pleased to find that after some time this plot partially resumed its former darker green colour."

19. WOOL.

For the best Essay on the Structure, Conformation, and Physical Properties of Wool; and on the Nature and Uses of the Sebaceous Secretion of the Skin of the Sheep—the Yolk—The Gold Medal or Ten Sovereigns.

Note.—Under the former head must be included a detailed description of the different kinds of Wool which are at present cultivated in the United Kingdom, with deductions from their structure as to their comparative value and utility for manufacturing purposes; and, under the latter, the special influences which the yolk exerts upon the Wool, the necessity or inutility of artificial salving, and in those circumstances where such has been used, the safest and most efficacious methods of removing it from the fleece, and the bleaching and purifying of the Wool from the "gilting" that may have resulted from its application.

Essays to be lodged on or before the 10th day of November 1847, under the conditions on pages 493 and 494.

20. ANALYSES OF THE ASHES OF PLANTS.

For the best Series of Quantitative Analyses of the Ashes of the Cultivated Plants, or of the more common weeds growing on the different soils in Scotland—Fifty Sovereigns.

Note.—As the Society has already offered premiums for the Analyses of Oats and Potatoes, Competitors who make choice of cultivated plants will select any of the others in common cultivation, as wheat, barley, turnips, or beans.

The more abundant weeds should also be selected for analysis, full grown healthy plants being in every case taken.

Separate analyses should be made of the stalk of the plant and of the seeds, and in the turnip, or other plants with large roots, also of the bulb. Intending Competitors are referred to the latest edition of Liebig's Agricultural Chemistry; and, for an account of the best method of ash analysis, to a paper by Drs. Will and Fresenius on the inorganic constituents of plants, in the Memoirs of the Chemical Society of London, part 9.

Essays to be lodged on or before 10th day of November 1848, under the conditions on pages 493 and 494.

21. EXPERIMENTS IN DEEP PLOUGHING.

In order to obtain information on the results of subsoil ploughing, trench-ploughing, or any other mode of deep ploughing on thorough-drained land, or on land that does not require draining, with the comparative merits of the different modes on the same soil, the Society offers an annual Premium of the Gold Medal for the best and most satisfactory account of experiments made on not less than four acres of land of as nearly as possible the same quality and description—stating the description of soil, and the subsoil upon which it rests—in each of the methods of ploughing, one half of which shall have been deep ploughed, and the other half cultivated in the ordinary way. The whole extent of ground to be under the same description of crop, and in other respects both portions to be cultivated and

managed alike. The quantity and quality of the produce of each portion to be stated; the depth reached by the plough to be noticed, with such other observations as the experimenters may deem deserving of attention.

Besides the principal Premium for the year, the Society proposes to give Honorary Premiums for such reports as shall be deserving of distinction.

Reports to be lodged on or before the 10th November in any year, under the conditions on pages 493 and 494.

22. VEGETABLE PRODUCTIONS OF INDIA, CHINA, AND AMERICA.

The Gold Medal will be given for the best, and the Medium Gold Medal for the next best and approved Report, on the Hardy or supposed Hardy Trees, and useful Herbaceous Plants, including Grains and Grasses, of China, the Himalaya country, the Falkland and South Sea Islands, California, and the high north-western districts of America, where such climate exists as to induce the belief that the Plants may be beneficially introduced into the cultivation of Scotland.

There being reason to believe, that in addition to the useful vegetable, productions which have of late years been introduced from Upper India, California, &c., many others may exist in the same regions, and in China, equally well suited to this climate, the Society has been induced to offer the above Premiums, with a view towards obtaining the fullest information relative both to the unintroduced sorts and those already known in this country, for the purpose of encouraging the introduction of the former, as well as the more extended culture of the latter. Reporters are, therefore, required to give the generic and specific names, with the authority for the same—together with the native names, in so far as known; also to state the elevation of the locality and nature of the soil in which they are cultivated, or which they naturally inhabit, with their qualities or uses; and it is farther requested, that the descriptions be accompanied, in so far as possible, with specimens of the plants and their fruit, seed, timber, or other products.

The transmission of living plants in boxes, or in cases covered with glass, may be attempted where practicable; the external air being excluded, and almost no water given during the voyage. Where this plan is adopted, smaller seeds, berries, or heps, may be thickly mixed with the soil or earth in which the plants are placed. Seeds may be sent home in the cones, wrapped in brown paper, packed in

a box, to be kept in a cool airy part of the cabin, but on no account in the hold, nor in close tin cases. In the event of the seeds of Coniferæ being separated from the cones, with the view of lessening the bulk and weight of packages intended for overland carriage, hasty and severe heating, in extracting the seeds, should be carefully avoided.

Reports to be lodged by the 10th November in any year.

23. REPORTS ON IMPROVED RURAL ECONOMY ABROAD.

The Honorary Gold or Silver Medal of the Society, according to the value of the communication, will be given for approved accounts, founded on personal observation, of any useful practice or practices in Rural or Domestic Economy, adopted in other countries, which may seem fitted for being introduced with advantage into Great Britain.

The purpose chiefly contemplated by the offer of this Premium, is to induce gentlemen who may visit other countries to take notice of and record such particular practices as may seem calculated to benefit their own country in the branches of the arts referred to. The earliest opportunity will be taken of communicating the Reports to the public.

Reports to be lodged by the 20th October in any year.

CONDITIONS OF COMPETITION FOR ESSAYS AND REPORTS.

The General Conditions of Competition for Essays and Reports will be found under the "Notice to Candidates," on pages 493 and 494, to which Competitors are particularly referred.

ROCKS, MINES, AND MINERALS.

This section of the Premiums has been suspended, there being in hand a considerable accumulation of unpublished Surveys and Reports.

CLASS II.

AGRICULTURAL MACHINERY.

1. ON THE COMPARATIVE ADVANTAGES OF DIFFERENT DESCRIPTIONS OF MACHINES FOR THRASHING GRAIN.

A Premium of Twenty Sovereigns will be given to the person who shall communicate to the Society the most satisfactory report

of a series of experiments, properly authenticated, showing the comparative results of thrashing a given quantity of the same kind and quality of grain by the common Scotch Thrashing Machine, by the Peg Drum Machine; and also, where practicable, by the English High Speed Beater.

Each machine employed in the experiments must be fitted with shaking and dressing or winnowing machinery, so that the grain may be delivered from the machine fit for market. The quantity thrashed in one experiment on each machine is not to be less than five quarters, and the experiment repeated three times, but it is not essential that the kind and quality of the grain be the same for each repetition.

For the convenience of comparison, it is desirable that the *power* employed should in all cases be horses, and the same set in all cases, but if it is found necessary to use steam machines, non-condensing engines should be preferred as being more easily compared,—and in such cases the pressure of the steam per square inch in the boiler must be carefully registered, and, if possible, also in the cylinder, by means of the steam indicator. The diameter of the cylinder, length of stroke of the piston, and number of strokes per minute, to be also noted.

Competitors, in stating their results, are requested to have regard to the quantity of grain thrashed—the time and power employed—the quality of the thrashing, whether clean or foul—the state of the straw, whether it is broken or remaining entire, by comparison from the different machines; and also the condition of the dressed grain, whether any portion of it has been broken or bruised. The average length of straw in the sheaf, and any other particulars that may appear to the experimenter to be of importance, to be also noticed.

Reports to be lodged on or before the 10th November 1846, under the conditions on pages 493 and 494.

2. INVENTION OR IMPROVEMENT OF IMPLEMENTS OF HUSBANDRY.

To the person who shall invent or improve any Instrument or Machine applicable to Husbandry or Rural Economy, which, from its utility in saving labour or expense, simplicity, or cheapness of

construction, or other circumstances, shall be deemed by the Society deserving of public notice—The Gold or the Silver Medal, or such sum in money as the communication shall appear to deserve.

The account of the implement must be accompanied by a model, made to a scale of three inches to the foot, to be deposited in the Society's Museum. The model to be formed of wood or metal; and the notice or description transmitted with it must specify, according to the best of the inventor's abilities, the purpose or advantage of his invention or improvement. When machines or models are transmitted, it must be stated whether they have been elsewhere exhibited or described. Models and descriptions may be lodged at any time with the Secretary.

CLASS III.

WASTE LANDS.

1. IMPROVEMENT OF A SPECIFIED EXTENT OF WASTE LAND BY TILLAGE.

To the Proprietor or Tenant in Scotland who shall, on or before the 10th of November in any year, transmit to the Society the most satisfactory Report of having successfully improved, and brought into profitable tillage, within a period of five years immediately preceding the date of his communication, an extent of waste and hitherto uncultivated land, not being less than one hundred acres—The Gold Medal.

To the Tenant in Scotland who shall, on or before the 10th of November in any year, transmit to the Society a satisfactory Report of having, within the period of three years preceding the date of his Report, successfully improved, and brought into profitable tillage, an extent of waste and hitherto uncultivated Land, not being less than thirty acres on the same farm—The Honorary Silver Medal.

The Reports in competition for both premiums may comprehend such general observations on the Improvement of Waste Lands as the writer's experience may have led him to make; but they are required to refer especially to the land reclaimed, (which, if not in one continuous tract, must be in fields of considerable extent) to the nature of the soil, the previous state and probable value of the

ground, the obstacles opposed to its improvement, the mode of management adopted, the expense, and, in so far as can be ascertained, the produce and value of the subsequent crops; and the land must have borne one crop of grain, at least, previous to the year in which the Report is made. The Reports must be accompanied by a detailed statement of the expense, and by a certified measurement of the ground. Competitors for the more limited extent improved will observe, that, having gained the Silver Medal, it shall not afterwards be competent to include the same improvement in a subsequent claim for the Gold Medal. Competitors for both Premiums will attend to the general conditions, which will be found on pages 493 and 494.

2. IMPROVEMENT OF MUIR OR MOSS GROUND BY TOP-DRESSING.

To the Proprietor or Tenant in Scotland who shall, on or before the 10th of November in any year, transmit to the Society the most satisfactory Report of having, within the three years immediately preceding the date of his Report, successfully improved the pasturage of not less than fifty acres of Muir or Moss Lands, by means of Top-Dressing without Tillage—The Gold Medal.

The Society has been given to understand, as the result of actual experiment, that a great extent of muir and moss land in Scotland may be converted into, comparatively speaking, superior pasturage, by top-dressing without tillage; and it is, therefore, desirous of encouraging, and also receiving reports of such experiments. Reports must state the particular mode of top-dressing adopted, and the expense per acre, and as many particulars as possible regarding the previous natural products of the soil, the elevation of the ground, and the changes produced by the application of the top-dressing, and also whether and to what extent, the lands had been at the same time, or previously, drained.

CLASS IV.

CROPS AND CULTURE.

1. NEW PLANTS ADAPTED TO FIELD CULTURE.

To the person who shall, on or before the 10th of November in any year, report to the Society any new species or variety of useful

Plant adapted to the ordinary field-culture of Scotland—The Gold or Silver Medal, or a Piece of Plate, as the Directors may see fit in the circumstances of the case.

Attention is directed to the raising or procuring of new varieties of cereal grains and leguminous plants, as well as of the more useful herbage and forage plants, and particularly of a nutritious and succulent vegetable for Spring food for Ewes, to preserve them in Milk in seasons when Grass is late, and Turnips have lost their properties for that object.

Specimens of the Grains and Plants to be transmitted, if this can conveniently be done.

2. SEED FOR CORN AND OTHER CROPS.

The Society, with the view of aiding Local Associations and Individuals in the improvement of the different varieties of Grain, &c., best adapted for their respective localities, offers for each of the years 1845 and 1846, in six several Districts, the Society's Silver Medal to the Grower of the best of each of the following Seeds raised in the District in which the Competition is held.

1. For the best and approved parcel of any named variety of White Seed Wheat.
2. For the best and approved parcel of Red Seed Wheat.
3. For the best and approved parcel of Chevalier Barley.
4. For the best and approved parcel of any other named variety of Seed Barley.
5. For the best and approved parcel of Potato Oats.
6. For the best and approved parcel of Hopetoun Oats.
7. For the best and approved parcel of any other named variety of Early Seed Oats.
8. For the best and approved parcel of any named variety of late Seed Oats.
9. For the best and approved parcel of any named variety of Field Bean.
10. For the best and approved parcel of any named variety of Early Field Peas.
11. For the best and approved parcel of any named variety of late Field Peas.
12. For the best and approved parcel of Common Tares or Vetches.

13. For the best and approved parcel of perennial Rye Grass Seed.

14. For the best and approved parcel of Timothy Grass Seed.

15. For the best and approved parcel of any variety of Potato.

CONDITIONS.

1. The Local Associations and individuals intending to institute competitions for any of the above medals, to lodge with the Secretary of the Society a statement of the different descriptions of seeds intended to be competed for, with a satisfactory guarantee that Money Premiums shall be given to the extent of not less than L.2 sterling, for each variety of such seeds.

2. In each District, a Convener, to be appointed by the Society, with the aid of the other Members of the Society in the District, and of the Local Association or Individual contributing the Money Premiums, will fix the time and place of Competition, appoint the Judges, and make all other necessary arrangements.

3. The quantity shown in Competition by each grower must not be less than three quarters of each variety of grain, two quarters of Beans, Peas, Vetches, and Grass Seeds, and half a ton of Potatoes.

4. The Judges shall be guided in their awards—1st, By the purity of the Seed;—2d, By its freeness from extraneous Seeds;—and, 3d, Where there is an equality in these respects, by the weight. A Schedule will be furnished to the Conveners in the several Districts, for making up the Reports to the Society, which must be lodged by the 10th of November in the year in which the Competition takes place.

5. The successful Competitors must, immediately after their preference is declared, transmit to Mr. Young, Assistant to the Curator of the Society's Museum, free of expense, a sample of each of the prize seeds, &c.; and the awards of the Judges must be reported by the Convener to the Society within eight days after the Competition. Where the Seed consists of Grain, the quantity transmitted not to be less than half a gallon. It is required that the produce per imperial acre should be stated, as far as can be ascertained, as well as the altitude, exposure, and nature of the soil, on which the crops were raised, together with the dates of sowing and reaping.

Applications have been received, and sustained in the present year, for,

First District—Lower District of Annandale: Premiums to the growers of,

1. The best and approved parcel of Red Seed Wheat.
2. The best and approved parcel of Potato Oats.
3. The best and approved parcel of Perennial Rye Grass Seed.
4. The best and approved parcel of any variety of Potato.

Second District—The County of Nairn: Premiums to the growers of,

1. The best and approved parcel of any named variety of White Seed Wheat.
2. The best and approved parcel of any named variety of Seed Barley.
3. The best and approved parcel of any named variety of Early Seed Oats.

4. The best and approved parcel of any named variety of late Seed Oats.

5. The best and approved parcel of perennial Rye Grass Seed.

THIRD DISTRICT—DALKEITH: Premiums to the growers of,

1. The best and approved parcel of any named variety of White Seed Wheat.

2. The best and approved parcel of Red Seed Wheat.

3. The best and approved parcel of Chevalier Barley.

4. The best and approved parcel of any other named variety of Seed Barley.

5. The best and approved parcel of Potato Oats.

6. The best and approved parcel of Hopetoun Oats.

7. The best and approved parcel of any other named variety of Early Seed Oats.

8. The best and approved parcel of any named variety of late Seed Oats.

9. The best and approved parcel of any variety of Potato.

FIRST DISTRICT—Convener, Colonel Graham of Mossknow.

SECOND DISTRICT—Convener, William Mackintosh, Esq. of Geddes.

THIRD DISTRICT—Convener, Robert Scott Moncrieff, Esq.

The premiums in these districts will be awarded under the general conditions above mentioned.

Applications from any of the above districts which may desire to have the premiums continued for another year, or from other districts which have not already had the Premiums, to be lodged with the Secretary of the Society by 10th of November next. The Directors will select from the applications the six Districts for 1846.

3. TURNIP SEED.

1ST, SWEDISH TURNIP.

DISTRICT—THE COUNTIES OF BERWICK AND ROXBURGH.

(1.) The Society's Gold Medal, or Ten Sovereigns, will be awarded in 1846 to the person in the Counties of BERWICK and ROXBURGH who shall have grown, in that year, a quantity of not less than ten quarters of the most approved quality of seed of any variety of yellow-fleshed Swedish Turnip, either from the best and purest approved stock of mature selected and transplanted bulbs, or from the seed of turnips which shall have been so selected and transplanted.

N.B.—This Premium was last year intimated for competition in 1845 in the county of Ayr.

2D, YELLOW FIELD TURNIP.

1. DISTRICT—THE ISLANDS OF ORKNEY.

(2.) The Society's Gold Medal, or Ten Sovereigns, will be awarded in 1845 to the person in the district of ORKNEY, who shall, in that year, have grown a quantity of not less than ten quarters of the most approved quality of seed of any variety of Yellow Field Turnip (Swedes excepted,) from the best and purest approved stock of mature selected and transplanted bulbs, or from the seed of turnips which shall have been so selected and transplanted.

2. DISTRICT—THE COUNTIES OF ABERDEEN AND KINCARDINE.

(3.) The Society's Gold Medal, or Ten Sovereigns, will be awarded in 1846, to the person in the Counties of ABERDEEN and KINCARDINE, who shall, in that year, have grown a quantity of not less than ten quarters of the most approved quality of seed of any variety of yellow Field Turnip, (Swedes excepted,) from the best and purest approved stock of mature selected and transplanted bulbs, or from the seed of turnips which shall have been so selected and transplanted.

Considerable disappointment and loss having been experienced of late years by turnip growers in certain districts, from inattention to the proper selection and management of seed crops, and their isolation from other similar crops, the Society offers the above Premiums with the view of directing attention to, and encouraging the more careful growth of turnip seeds from selected and transplanted stocks.

Competitors for 1845 must have lodged intimation of their intention with the Secretary of the Society, on or before the 1st of December last; and competitors for 1846 must make similar intimation on or before the 1st of December next, so as to admit of an inspection of the growing crops being made by persons appointed by the Society, who will be guided in their opinions,

1st, By the purity of the stock.
2d, By the symmetry of the form.
3d, By the apparent hardiness of the variety.
4th, By its apparent capability of yielding a bulky or heavy crop; and, after harvest,
5th, By the quality of the seed raised.

Competitors in 1845 are required to lodge, on or before the 10th November next, and those in 1846, on or before the 10th November

in that year, a properly certified statement of the extent of ground they had under crop, and the quantity of clean marketable seed harvested, accompanied with a fair sample of not less than one peck, and twenty plants of each variety of the turnip, as specimens, to be delivered free at the Society's Museum, George IV. Bridge, Edinburgh.

NOTE.—It has been observed by Mr. Cobbold (a distinguished agriculturist of Suffolk, and one of the earliest cultivators of the Swedish Turnip in that district) that, in Scotland, sufficient attention is not generally paid to the selection of the best varieties of Swedes for the production of seed; that those plants having long stalk-like tops, and coarse fibrous-rooted or discoloured bulbs, should be rejected; and those alone employed which have very short tops, and clean smooth bulbs, with only a small tap-root; and that they should be grown completely apart, and at as great a distance as possible from all similar crops. In Suffolk, Mr Cobbold mentions, the transplanted bulbs are generally placed in rows two feet and a half apart, but the turnips in the row are set so closely together, that they almost touch each other.

Nearly the same observations are applicable to the want of attention, in too many instances, in the selection of Yellow Turnips, from which seed is intended to be raised.

4. Green Crops on Hill Farms.

The Society, with the view of aiding Local Associations in their efforts for improving the management of Turnip and Potato Cultivation on *Hill Farms*, which has been represented as being still extremely defective in several districts, offers the following Premiums for Competition in 1845 and 1846, the one-half of the amount to be contributed by each Association claiming the Premiums.

I. For the best managed Crop of Potatoes or Turnips in respect to the cleaning of the land, and the general good working of the Crop—Three Sovereigns.

II. For the second best ditto.—Two Sovereigns.

III. For the third best ditto.—One Sovereign.

CONDITIONS.

1. The proportion of Green Crop, of Turnip, and Potato, shall be one-third of the land under crop on the farm.
2. The minimum extent of land under green crop, as above, shall be six imperial acres.
3. The proportion of Turnip shall be at least one-fourth of the green crop as above.
4. The whole land of the farm under green crop shall be shown in competition.
5. The Premiums are offered for Competition in the years 1845 and 1846. Applications by Local Associations, accompanied by guarantees for payment of one-half of the amount of the Premiums, to be lodged with the Secretary of the Society on or before the 1st day of May in each year.
6. The names of intending Competitors to be intimated to the Conveners to be ap-

pointed by the Society, on or before the 15th day of May in each year; and it shall then be competent to the Convener to add such others to the List as he may think deserving of encouragement, but after that day no additional name shall be received.

7. There must not be fewer than two Competitors in each District; and the Convener and Committee shall have power to withhold the Premiums, or divide them in such manner as they shall consider most equitable. The gainer of the first Premium to be precluded from competing in the subsequent year. In the event of there being only one Competitor, it will be in the power of the Committee to vote a portion of one of the Premiums, if his merits shall appear to be such as to deserve it.

8. The Inspectors to be fixed by the respective Conveners, with the assistance of such other Members of the Society as may attend, shall decide the Premiums.

The awards to be made and intimated to the Secretary of the Society on or before the 1st of December in each year; and Conveners are particularly requested to state in their reports the proportion of each lot cropped, as above mentioned, and to offer any suggestions which they may consider of importance.

5. PREMIUMS FOR GREEN CROPS ON SMALL POSSESSIONS.

The Society, with the view of improving the cultivation of small possessions, by the introduction of Green Crops, will give the following Premiums in the Parishes after mentioned, viz.:

Perthshire.

The PARISHES OF KENMORE AND KILLIN, including the portion of the parish of WEEM on LOCH TAYSIDE.—Convener, the Marquis of Breadalbane.

Aberdeenshire.

PARISH OF NEW PITSLIGO.—Convener, Sir John Stuart Forbes, Bart. of Pitsligo.

PREMIUMS.

For the best and approved Green Crop—Three Sovereigns.
For the second best do.—Two and a-half Sovereigns.
For the third best do.—One and a-half Sovereign.
For the fourth best do.—One Sovereign.

CONDITIONS.

1. The Competition to be limited to Tenants occupying not more than 40 acres of land.

2. The quantity of ground under Green Crop to be fixed by the Convener,—at least one-half of the Green Crop to be Turnips, and that portion which is in Green Crop in 1845 must be sown out, with sufficient quantities of Clovers and Rye Grass, with the White Crop in 1846.

3. The names of intending Competitors to be intimated to the Conveners appointed by the Society, on or before the 15th day of May 1845; and it shall then be competent to the Convener to add such others to the List as he may think deserving of encouragement, but after that day no additional name shall be received.

4. There must not be fewer than two Competitors in each District; and the Convener and Committee shall have power to withhold the Premiums, or divide them in such manner as they shall consider most equitable. The gainer of the first Premium

to be precluded from competing in subsequent years. In the event of there being only one Competitor, it will be in the power of the Committee to vote a portion of one of the Premiums, if his merits shall appear to be such as to deserve it.

5. The Inspectors to be fixed by the respective Conveners, who, with the assistance of such other Members of the Society as may attend, shall decide the Premiums.

The awards to be made and intimated to the Secretary of the Society on or before the 1st of December in each year; and Conveners are particularly requested to state in their reports the proportion of each lot cropped, as above mentioned, and to offer any suggestions which they may consider of importance.

Similar Premiums will be given in four additional Parishes in the year 1846, and three succeeding years, on guarantees for the payment of one-half of the Premiums being lodged with the Secretary on or before the 1st of October 1845.

6. PLOUGHING COMPETITIONS.

Premiums to ploughmen for improvement in Ploughing having for some years been given very generally over the country by the resident Gentlemen and Local Farming Societies, the Highland and Agricultural Society has, in the meantime, discontinued its money prizes; but, being desirous of encouraging improvement in this branch of husbandry, the Society will give its Silver Plough Medal to the Ploughman found to be the best at such competitions, whether he has gained the Medal at a previous Competition or not, provided not fewer than fifteen Ploughs shall have started, and that Premiums in money to an amount not less than Three Sovereigns shall have been awarded. It shall be imperative on the Judges of the competition, in deciding on the merits of the competitors, to take into consideration the time occupied in ploughing the ground assigned to them respectively; and in all cases to give the Society's Medal to the competitor found entitled to the first money premium in addition to it. The Medal will be issued upon a report from one or more Members of the Society, who shall have actually attended the competition. This Report must state,

1. The date and place of Competition.
2. That the Member who signs the Report was present at the Competition.
3. The number of Ploughs which competed.
4. The number and amount of the money premiums awarded.
5. The names of the Ploughmen to whom the premiums were awarded; and, if servants, in whose employment they are; the estimated quantity of ground assigned for ploughing; the time occupied by the competitors respectively in ploughing it; the sum voted to each; and that the Society's Medal was awarded to the gainer of the first money premium.

The Report must be lodged with the Secretary, at the Society's Hall, within three months from the date of the Competition, and must state the above particulars, otherwise the Medal will not be issued.

NOTE.—The Society has been induced to make the stipulation as to *time* forming an element in the merits of Competitors, from having observed the bad effects of omitting it in some Competitions, by which the Ploughmen were led in some measure to underrate the importance of time in Ploughing, as well as in all other farming operations; and the Society would suggest for the consideration of the resident Gentlemen and Local Societies, that on land of average tenacity the rate of Ploughing should not be less than will turn over an imperial acre in ten hours.

The Society would also recommend, that in estimating the work of Competitors, attention should be directed to its sufficiency below, as well as to its neatness above, the surface.

CLASS V.

LIVE STOCK—DISTRICT COMPETITIONS.

§ I. CATTLE.

PREMIUMS FOR IMPROVING THE BREED OF CATTLE IN THE FOLLOWING DISTRICTS.

1. *The Parishes of Banchory-Ternan, Strachan, Glentanner, Birse, Kincardine-O'Neil, Echt, Peterculter, Drumoak, Durris, Maryculter, Lumphanan, and Midmar, in the Counties of Aberdeen and Kincardine.*
2. *The Parishes of Cargill, Collace, Kinclaven, Cupar-Angus, Bendochy, Blairgowrie, Alyth, Ruthven, Airlie, Glammis, Essay, Nevay, Meigle, Newtyle, Kettins, and Caputh, in the Counties of Perth and Forfar.*
3. *The Parishes of Maybole, Kirkmichael, Straiton, Dailly, and Kirkoswald, in the County of Ayr.*
4. *The County of Sutherland.*
5. *The County of Banff, excepting the Parishes of Inveravon, Kirkmichael, Mortlach, and Aberlour, and those parts of Banffshire in the Turriff District.*
6. *The Parishes of Strathdon, Glenbucket, Auchindoir, Kildrummy, Loechel-Cushney, Towie, Tarland, Migvie, Aboyne, Logie Coldstone, Coul, those parts of the Parish of Tullich in Cromar, and those parts of the Parishes of Glenmuick, Glengairn, and Tullich, and of Crathie, which are on Gardenside, and in Morven.*

7. *The Parishes of Auchterarder, Blackford, Muthill, Comrie, Monzievaird and Strowan, Crieff, Monzie, Fowlis Wester, Madderty, and Trinity Gask, in the County of Perth.*
8. *The County of Caithness.*
9. *The County of Dumbarton, excepting the detached Parishes of Cumbernauld and Kirkintulloch, and also that portion of the County of Renfrew situated on the right bank of the River Clyde.*
10. *The District of Lorn, Argyllshire, comprehending the country from Kilmelford to Lochaw, by Lochavich, and the Water of Avich; from thence by Lochaw to the Water of Tettle, including the country of Glenorchy to the head of Lochleven; and from thence to Linealich by the Sound of Corryvreckan to Lochmelford.*
11. *The Parishes of Tullynessle and Forbes, Keig, Leslie, Alford, Touch, Monymusk, Kenmay, and Cluny.*

Class I.

1. For the best Bull, above two and under eight years old, to be exhibited at the Competition in each of the four Districts, Nos. 4, 6, 10, and 11, as above described, *bona fide* the property of a Proprietor, Factor, or Tenant, and kept in his possession from the 20th day of May preceding the Competition—The Honorary Silver Medal.

2. For the best Bull, above two and under eight years old, *bona fide* the property, and in possession of any Tenant in each of the said four Districts, Nos. 4, 6, 10, and 11, kept on his farm within the District, from the 20th day of May preceding the Competition—Ten Sovereigns.

3. For the second best Bull, of the same age, in each of the said four Districts, the property, and in the possession of any Tenant, and kept on his farm, within the District, for the aforesaid period—Five Sovereigns.

Class II.

1. For the best Bull, above two and under eight years old, *bona fidè* the property, and in possession of any Proprietor or Tenant, in *each* of the seven Districts, Nos. 1, 2, 3, 5, 7, 8, and 9, as above

described, kept on his farm, within the District, from the 20th day of May preceding the Competition—Ten Sovereigns.

2. For the second best Bull, of the age above specified, *bona fide* the property, and in possession of any Proprietor or Tenant, in *each* of the said seven Districts, and kept on his farm within the District for the aforesaid period—Five Sovereigns.

Class III.

1. For the best two Queys of two years old, the property of, and bred by, any Tenant in *each* of the said eleven Districts, No. 10 excepted—Five Sovereigns.

2. For the second best two Queys of two years old, the property of, and bred by, any Tenant in each of the said eleven Districts, No. 10 excepted—Three Sovereigns.

Class IV.

1. For the best two Queys of the West Highland breed, not exceeding three years off, the property of, and bred by, any Tenant in the said District, No. 10—Five Sovereigns.

2. For the second best two Queys of said breed, not exceeding three years off, the property of, and bred by, any Tenant in the said District, No. 10—Three Sovereigns.

The Competition in the Districts, Nos. 1 to 7, both inclusive, will take place in 1845, and in Nos. 8 to 11, both inclusive, it will take place in 1846.

For the First District—Sir Thomas Burnett of Leys, Bart., and William Innes, Esq. of Raemoir, or either of them, to be Convener of the Society's resident Members; four to be a quorum of the Committee.

For the Second District—Sir J. Muir Mackenzie of Delvine, Bart.; in his absence, Hugh Watson, Esq. Keillor, to be Convener of the Society's resident Members; five to be a quorum of the Committee.

For the Third District—Sir Charles Dalrymple Fergusson, Bart.; in his absence, James Campbell, Esq. of Craigie, to be Convener of the Society's resident Members; five to be a quorum of the Committee.

For the Fourth District—His Grace the Duke of Sutherland; in his Grace's absence, George Gunn, Esq. Rhives, to be Convener of the Society's resident Members; three to be a quorum of the Committee.

For the Fifth District—Right Hon. the Earl of Seafield; in his Lord-

ship's absence, Colonel Gordon of Park; in absence of both, John Fraser, Esq. Cullen House, to be Convener of the Society's resident Members; five to be a quorum of the Committee.

For the Sixth District—Right Hon. the Earl of Aboyne, and Alexander Leith, Esq. younger of Freefield; in their absence, the Rev. Robert Meiklejohn, Strathdon, and Andrew Robertson, Esq. Tarland, to be Conveners of the Society's resident Members; five to be a quorum of the Committee.

For the Seventh District—The Right Hon. Viscount Strathallan; in his Lordship's absence, John Stewart Hepburn, Esq. of Colquhalzie, to be Convener of the Society's resident Members; three to be a quorum of the Committee.

For the Eighth District—Sir George Dunbar of Hempriggs, Bart.; in his absence, James Sinclair, Esq. of Forss, and Robert Innes, Esq. of Thrumster, to be Conveners of the Society's resident Members; three to be a quorum of the Committee.

For the Ninth District—The Duke of Montrose; in his Grace's absence, Alexander Smollett, Esq. of Bonhill, M.P., to be Convener of the Society's resident Members; three to be a quorum of the Committee.

For the Tenth District—The Marquis of Breadalbane; in his Lordship's absence, Dugald Macdougall, Esq. of Gallanach, to be Convener of the Society's resident Members; three to be a quorum.

For the Eleventh District—Lord Forbes and Robert Grant, Esq. of Tilliefour, or either of them, to be Convener of the Society's resident Members; three to be a quorum of the Committee.

Blank Reports and Returns of Competitions will be furnished to Conveners of Districts; and it is particularly requested that they may be carefully preserved till required, and accurately and distinctly filled up at the proper time.

RULES OF COMPETITION.

1. The Members of the Society resident in, or connected by property with, the respective Districts, are hereby appointed Committees of Superintendence for regulating the Competitions in their several Districts.

2. With the view of putting preparatory arrangements in train for the Competition, the Convener or Conveners of each District in which the Premiums are this year in competition, will summon by circular letters, or in such other manner as they may think expedient and equally effectual, a Meeting of the Society's Members connected with the Districts, to be held at such time and place as the Convener may appoint, not being later than the 20th of May, for the purpose of fixing the time of competition (and also the place of competition, when not already fixed,) and of naming a Sub-Committee for making all necesary preparatory arrangements for the Show,—including the nomina-

tion of Judges, if they propose to call practical judges to their assistance; and of giving due intimation, as after directed, of the time and place of Competition.

3. The Meetings of the Committee of Superintendence, and attendance at competitions for Premiums, to be open to all Members of the Society; and not fewer than the prescribed quorum of the Committee to be present.

4. The Conveners, with the approbation of a quorum of the Committees for conducting the several competitions, are respectively authorised, in such cases as they shall see proper, to divide the two Premiums allowed for Bulls into three Premiums in such proportions as they shall approve,—the first Premium not being less than Eight Sovereigns; and, in like manner, to divide the sums allowed for Queys into three Premiums, fixing their amount.

5. The Committee shall not place for Competition any Stock which, in their opinion, does not fall within the regulations prescribed, or does not possess merit; and in no instance shall any of the Money Premiums be awarded where there are not, after such selection, at least three Competitors. The Committee are, however, authorised in any case of deficiency in the required number of Competitors, to make such allowance to a party showing stock of merit, not exceeding half the amount of the Premium, as, under the circumstances, they may think reasonable.

6. The times and also the places of Competition are to be fixed by the Conveners, with the advice of at least a quorum of their respective Committees, except in the 6th District, in which Strathdon and Tarland alternately are fixed, and in the 10th District, in which Oban is fixed. The Competitions for the Society's and for the District Premiums are to take place between the 1st of June and 1st of November next.

7. The Conveners will be particularly careful, that the times and places of Competition, are intimated throughout their several Districts, two weeks, at least, previously to the days appointed for the Competitions, in such manner as the respective Local Committees shall deem most effectual for communicating the information to all persons interested; and the modes of intimation which may be adopted in the different Districts, as well as the periods of announcement, must be stated in the Reports of the Competitions.

8. As these Premiums were given, in some of the above-mentioned Districts, in 1841, 1842, and 1843, it is to be observed that the Society does not admit an animal, in any Class of Stock, which may have gained the Society's first Premium at a District or General Show in a former year, to be again shown in Competition in any District; and for no description of Stock shall either the same or a lower denomination of Premium be awarded, in the District in which it has already gained a Premium. In those Districts where the Honorary Silver Medal is offered for Bulls, Tenants cannot compete with the same animal, both for the Honorary and the Money Premiums.

9. No Member of the Committee showing Stock of his own at the Competition shall act as a judge; nor shall Factors, when they are Members of the Society, and are named on the Committee, or when acting in the absence of Proprietors, be entitled to compete for the Money Premiums in those districts and classes in which Proprietors are excluded from Competition. It is recommended to the Committee to take the assistance of practical men as judges in awarding the Premiums. In all cases, the Bulls for which the Money Premiums are awarded, must have served, or shall be kept to serve, in the District, at least one season, and the rate of service may be fixed by the Committee. The same person is not to obtain more than one of the Premiums for Bulls, and one of the Premiums for Queys, in one year, except in a District where Tenants compete for the Honorary and Money Premiums for Bulls, in which case he may, with different animals, carry the Medal and one of the Money Premiums for

Bulls, besides a Premium for Queys. While the Directors have deemed it expedient to exclude Proprietors and Factors named on the Committee, or acting in the absence of Proprietors, from competing for the *Money Premiums* in certain Districts, where it is apprehended that the superiority of their Stock might discourage competition on the part of the Tenantry, they are fully impressed with the advantages of having such Stock exhibited at the District Shows, and have offered the Honorary Silver Medal of the Society for the best Bull exhibited at the Competition, whether the property of one of the parties aforesaid, or of a Tenant, if superior to the Bull to which the highest Money Premium is awarded. A Bull which, as the property of a Proprietor, a Factor, or a Tenant, may have gained the Honorary Medal, will be allowed to compete, in a future year, for the Money Premiums, when, *bona fide*, the property, and in the possession of a Tenant who shall not have been the gainer of the Medal, provided it shall have continued the Winner's property for, at least, one year after the award of the Medal, and shall have afterwards been the Tenant's property, and in his possession from the day fixed by the Regulations,—the 20th of May preceding the Competition. A Bull which may have been purchased by two or more tenants, for the use of their Stocks, will be allowed to compete, although the exhibitors may not be joint tenants. Purity of breed is to be taken into account in awarding the Premiums.

10. In order to entitle the Competitors to their respective Premiums, a regular Report, signed by the Convener, and, at least, a majority of the Committee who attend the Competition, must be transmitted by the Convener, so as to be received by the Secretary on or before the 10th of December next, and which Report must certify the following particulars, viz. :—

1. The total number of Bulls and Queys respectively offered for Competition.
2. The number of each admitted to Competition in their appropriate classes, with the number of Competitors in each class.
3. That the Bulls preferred were, *bona fide*, the property of the Competitors, and kept in their possession, or on their farms within the District, from the 20th of May preceding the Competition.
4. The whole periods during which the Bulls have been in their possession.
5. The ages of the Bulls.
6. That the Queys, being two years old, were bred by the Competitors, and were their property on the day of Competition.
7. The Names (Christian and surname) and Designations (Estate or Farm, and Parish) of the Persons to whom Premiums were adjudged, and the amount of Premium to each.
8. That due attention has been paid to the rule prescribed for the service of Bulls, for which Money Premiums are awarded.
9. The time and mode of the required previous intimation to the Committee of Judges, and notification to intending Competitors, &c. of the time and place of Competition, given, as directed by the Local Committee ; and, in general, the strict observance of all the Rules of Competition, fixed by the Society, as above detailed.

In case all the Members of the Committee who may have attended the Competition shall not have subscribed the Report, the Convener will mention the cause which may have prevented their doing so.

11. Further, it is to be distinctly understood, that in no instance does any claim lie against the Society for expenses attending a Show of Stock, beyond the amount of the Premiums offered.

12. With reference to the Competition in the 6th and 10th Districts, the Reports must bear, that the Bulls and Queys preferred were of the West Highland Breed.

The Conveners are requested to get the Reports drawn up and signed by a majority of the Committee present at the Competition before they separate.

NOTE.—The Society gives the Premiums for three Competitions in alternate years; and provided the gentlemen of the District, or any Local Association therein, shall have continued the Competitions, and have awarded and duly reported Premiums in the District to an amount not less than one-half of the Society's Premiums, and for the same descriptions of Stock, during the two intermediate years, the Society continues its Premiums to the District for an additional year. By this arrangement, each District may have the benefit of six Competitions. In the Districts Nos. 1, 2, 3, 4, 5, and 6, 1841 was the first Competition: they have this year the third year of the Society's Premiums; and if they shall have awarded Local Premiums in 1842 and 1844, they will each receive Premiums from the Society in 1846, for the sixth or additional year. In the District, No. 7, 1843 was the first year's Competition; it will again have the Society's Premiums in 1847; and if it shall have awarded Local Premiums in 1844 and 1846, the Society's Premiums will be given in 1848, for the sixth or additional year. In the Districts, Nos. 8, 9, 10, and 11, 1842 was the first year's Competition; the Society's Premiums will be again given in 1846; and in such Districts as Local Premiums shall have been awarded in 1843 and 1845, the Society's Premiums for the additional year will be given in 1847. Further, in order to encourage the Show for the Local Premiums, the Society, in those Districts in which the Honorary Silver Medal is offered, will continue it in the two intermediate years, under the same conditions as during the years when the Society's Premiums are given. A certificate of the Competition and Premiums awarded at the intermediate Local Shows in the several Districts, signed by at least two Members of the Society, must be transmitted to the Secretary of the Society, so as to be received by him on or before the 10th December in each year, in order to entitle the Districts to any claim for the additional year's Premiums.

§ II. HORSES.

1. PREMIUMS FOR IMPROVING THE BREED OF DRAUGHT HORSES.

The Islands of Orkney.

Twenty-five Sovereigns will be given by the Society, a sum not less than Twenty Sovereigns additional being given by the resident Gentlemen, or by Local Societies. Out of the Fund to be raised by the joint contribution, the following premiums will be given:—

1. For the best Stallion, not under three years and nine months, and not exceeding twelve years old, to be kept exclusively for the

mprovement of the breed of Draught Horses within the said District, and for this purpose, to be shown after the premiums have been awarded at such Stations as may be fixed by the Convener and Committee of Members of the Society resident in the District, at such time between the day of competition and the 1st August 1845, as the Committee may fix at a Meeting to be called by the Convener for the purpose—Twenty-five Sovereigns.

2. For the best Mare for breeding Draught Horses, not exceeding twelve years old, and which shall have had at least one foal, or shall be in foal at the time, *bona fide* the property and in possession of any tenant in the said District, from 1st January 1845, to the day of competition—Ten Sovereigns.

3. For the best well-bred Pony Stallion, not exceeding 14 hands high, not under three years and nine months, and not exceeding twelve years old, to be kept within the District between the day of competition and 1st August 1845—Ten Sovereigns.

NOTE.—The Premium for the best Stallion, No. 1, must be awarded under the condition, that the Prize Mare, and the Mare next in merit, shall have a preference of Service by the Prize Stallion, free of Charge; all the Competing Mares to have a preference over other Mares to Service by the Prize Stallion, on such terms and conditions as the Local Committee shall fix. In awarding the Premiums, purity of breed, and the pedigrees of the animals, will be taken into consideration.

RULES OF COMPETITION.

1. The Members of the Society in the District are hereby appointed a Committee of Superintendence, as in No. 1 of the Regulations for the Cattle Competitions; and they will be convened by the Convener on or before the 10th of March, in the same manner and for purposes similar to those indicated in No. 2 of the said Regulations.

2. The Meetings of the Committee of Superintendence, and attendance at Competitions for Premiums, to be open to all Members of the Society; and not fewer than the prescribed quorum of the Committee to be present.

3. The time and place of Competition for the Premiums are to be fixed by the Convener, with the concurrence of at least a quorum of the Committee, and are to be published by him in due time, and in such manner as shall be thought by the Committee most effectual for the information of those interested.

4. The Competition will take place betwixt 20th March and 1st May 1845. The Regulations for Cattle Shows, in regard to the previous intimation to the Committee and Competitors—the recommendation to the Committee to take the assistance of practical men as Judges—the power of the Committee to exclude stock, if the animals produced shall be of inferior character, and, in certain circumstances, to make an allowance for stock of merit—those relating to extra expenses, and against Competitors being also Judges—and the manner in which the Report is to be certified and transmitted to the Society, are severally hereby declared applicable to the Premiums for Horses. Evidence must be produced that the Prize Stallion has had produce.

James Baikie, Esq. of Tankerness; in his absence, Charles Gordon Robertson, Esq., Sheriff-Substitute, to be Convener of the Society's resident Members; three to be a quorum of the Committee.

2. PREMIUMS FOR HIGHLAND PONIES.

The District of Mull in Argyleshire.

The Society, desirous of directing attention to the improvement of the breed of Highland Ponies, offers the following premiums in the above District in 1845, a sum of Five Sovereigns in part of the premiums being guaranteed from the District.

For the best Stallion, not exceeding 14 hands high, not under three years and nine months, and not exceeding twelve years old, to be kept within the District between 1st April and 1st August 1845—Ten Sovereigns.

For the best Mare, not exceeding 14 hands high, and not more than ten years old, and which shall have had a foal, or be in foal at the time, the property, and in possession of any tenant in the District, from 1st January 1843 to the day of competition—Seven Sovereigns.

NOTE.—The Committee are authorised, if they see proper, to apportion the two Premiums into four, and to award Five Sovereigns for a Stallion of the native or Highland breed, and Five Sovereigns for a Stallion brought from any other District. The Sum for Mares may be divided into two Premiums of Four and Three Sovereigns. The Premium for the best Stallion must be awarded under the condition that the Prize Mare, and the Mare which shall be declared by the Judges next in merit, shall have a preference of Service by the Prize Stallion, free of Charge. The Rules of Competition to be the same as those for Work Horses.

It has appeared to the Society that the demand which exists for this race of active little horses, not only in the Highlands, but in the Lowlands of Scotland and in England, and the decrease in the numbers of the better class suited to the saddle in Districts where they were formerly reared, particularly in the Western Highlands and Islands, afford a sufficient inducement to the Society to call the attention of Highland Proprietors and their Tenants to this production of the country; not, however, with a desire of increasing the numbers reared beyond what the interests of the Breeders and the existing demand may require, but for the purpose of maintaining the purity and valuable properties of the Breed, by a proper selec-

tion of the male and female parents. The Society also calls the attention of those interested, to the necessity of not allowing the young stock, which go at large, to copulate promiscuously, as this must have the effect of deteriorating the breed, and will render the Premiums offered quite inefficient for the purpose intended. It is most desirable that the colts not intended for stallions, should be castrated before attaining the age of one year.

Colonel Campbell, of Possill; in his absence, Francis William Clark, Esq. of Ulva, to be Convener of the Society's resident Members; three a quorum. The Report of the Competition to be transmitted to the Society by 10th December 1845.

§ III. SHEEP AND WOOL.

1. PREMIUMS FOR IMPROVING THE BREED OF SHEEP.

I. LEICESTER SHEEP.

DISTRICTS.

1. *A District round Perth, comprehending the low country portions of Perthshire, and the adjoining Counties.*
2. *A District round Cupar in Fife, comprehending Fifeshire, and the contiguous portions of adjoining Counties.*
3. *A District round Kirkcudbright, comprehending the low country portions of Dumfries, Kirkcudbright, and Wigton Shires.*
4. *A District round Ayr, including the low country portions of Ayrshire, Renfrewshire, Lanarkshire, and adjoining Counties.*
5. *A District round Dalkeith, comprehending the Lothians, Berwickshire, Roxburghshire, and adjoining Counties.*

PREMIUMS IN EACH OF THE SAID DISTRICTS.

1. For the best Tup of any age, the property of the Competitor, which shall have served in the District the preceding season, or which shall so serve the season following the Exhibition—Ten Sovereigns.

2. For the best three Shearling Tups, the property of the Competitor—Ten Sovereigns.

3. For the best Pen of three Ewes, not less than two Shear, the property of the Competitor—Five Sovereigns.

4. For the best Pen of three Gimmers or Shearling Ewes, the property of the Competitor—Five Sovereigns.

In Districts Nos. 1, 2, and 3, the Competition will take place in 1845; and in Nos. 4 and 5 in 1846.

For the First District—The Right Hon. the Earl of Mansfield; in his Lordship's absence, Andrew Murray, Esq., of Murrayshall; in absence of both, Archibald Turnbull, Esq., Secretary, Perthshire Agricultural Society, Convener of the Society's resident Members; five a quorum.

For the Second District—Right Hon. the Earl of Leven and Melville; in his Lordship's absence, Major Anderson of Montrave, to be Convener of the Society's resident Members; five a quorum.

For the Third District—Right Hon. the Earl of Selkirk; in his Lordship's absence, Marmaduke Maxwell, Esq. of Terregles, to be Convener of the Society's resident Members; five a quorum.

For the Fourth District—The Marquis of Bute; in his Lordship's absence, Archibald Hamilton, Esq. of Carcluie, and James Campbell, Esq. of Craigie, Conveners of the Society's resident Members; five a quorum.

For the Fifth District—His Grace the Duke of Buccleuch; in his absence, Robert Scott Moncrieff, Esq., Convener of the Society's resident Members; five a quorum.

II. CHEVIOT SHEEP.

DISTRICTS.

1. *The Parishes of Jedburgh, Southdean, Oxnam, Crailing, Hobkirk, Bedrule, Cavers, Morebattle, Yetholm, Hownam, Linton, and Eckford, in the County of Roxburgh.*
2. *A District round Moffat, comprehending the Pastoral Districts of Dumfriesshire and of the adjoining Counties.*
3. *Ross-shire and Inverness-shire, comprehending the Pastoral Districts of these Counties within convenient reach of the Muir of Ord.*
4. *The District round Hawick.*

PREMIUMS IN EACH OF THE SAID DISTRICTS.

1. For the best Tup of any age, the property of the Competitor, which shall have served in the District the preceding season, or

which shall so serve the season following the Competition—Seven Sovereigns.

2. For the best Three Shearling Tups, the property of, and bred by the Competitor—Seven Sovereigns.

3. For the best Pen of Five Ewes, not less than Two Shear, the property of the Competitor—Five Sovereigns.

4. For the best Pen of Five Gimmers or Shearling Ewes, the property of, and bred by the Competitor—Five Sovereigns.

The Competition in the Districts Nos. 1, 2, and 3, will take place in 1845; and in No. 4 in 1846.

For the First District—Sir William Scott of Ancrum, Bart.; in his absence, John Scotland, Esq., Glendouglas, to be Convener of the Society's resident Members; four a quorum.

For the Second District—J. J. Hope Johnstone, Esq. of Annandale, M.P.; in his absence, Charles Stewart, Esq., Hillside, to be Convener of the Society's resident Members; five a quorum.

For the Third District—Right Hon. Lord Lovat, and Sir James J. R. Mackenzie, Bart., of Scatwell, to be Conveners of the Society's resident Members; five a quorum.

For the Fourth District—Allan Elliot Lockhart, Esq. of Cleghorn, to be Convener of the Society's resident Members; three a quorum.

III. BLACK-FACED SHEEP.

DISTRICTS.

1. *The District of Cowal, Argyllshire.*
2. *District of Atholl, including Glenerochy and Strathtummell, and Strathardle, Blackwater and Glenshee, above the Bridge of Calley in the County of Perth.*
3. *A District round Fort William, comprehending the portions of the Counties of Inverness, Argyll, and Perth, having convenient access to the place of Competition.*
4. *The District accessible to Kenmore, in Breadalbane.*
5. *The District accessible to Lochmaddy, including Barra, the Uists, Benbecula, Harris, and Lewis.*

PREMIUMS IN EACH OF THE SAID DISTRICTS.

1. For the best Five Tups, not exceeding four Shear, the property of any Proprietor, or of any Tenant in the District paying more than £150 of yearly rent—Seven Sovereigns.

2. For the best Five Tups, not exceeding four Shear, the pro-

perty of any tenant in the District paying not more than £150 of rent—Seven Sovereigns.

3. For the best Pen of Ten Gimmers or Shearling Ewes, belonging to any Proprietor, or to any Tenant in the District paying more than £150 of rent, and which shall be certified at the Competition to have been at least one year in his possession—Five Sovereigns.

4. For the best Pen of Ten Gimmers or Shearling Ewes, under the same condition, but being the property of a Tenant in the District paying not more than £150 of rent—Five Sovereigns.

The Competitions in the Districts Nos. 1, 2, and 3, will take place in 1845; and in Nos. 4 and 5 in 1846.

For the First District—Robert Maclachlan, Esq. of Maclachlan; in his absence, Alexander Lamont, Esq. of Knockdow, to be Convener of the Society's resident Members; three a quorum.

For the Second District—Right Hon. Lord Glenlyon; in his Lordship's absence, P. Small Keir, Esq. of Kinmonth, to be Convener of the Society's resident Members; five a quorum.

For the third District—The Right Hon. Lord Ward and Colonel Maclean of Ardgour, to be Conveners of the Society's resident Members; three a quorum.

For the Fourth District—The Marquis of Breadalbane; in his absence, Sir Robert Menzies of Menzies, Bart., to be Convener of the Society's resident Members; five a quorum.

For the Fifth District—Colonel Gordon of Cluny; in his absence, Charles Shaw, Esq., to be Convener of the Society's resident Members; three a quorum.

Blank Reports and Returns of Competitions will be furnished to Conveners of Districts; and it is particularly requested that they may be carefully preserved till required, and accurately and distinctly filled up at the proper time.

CONDITIONS AND RULES OF COMPETITION.

1. The Members of the Society in the several Districts are hereby appointed Committees of Superintendence, as in No. 1 of the Regulations for the Cattle Competitions; and they will be convened by their several Conveners on or before the 10th of May, in the same manner and for purposes similar to those indicated in No. 2 of the said Regulations.

2. The Meetings of the Committee of Superintendence, and attendance at Competitions for Premiums, to be open to all Members of the Society; and not fewer than the prescribed quorum of the Committee to be present.

3. It is an express stipulation in regard to the Premiums for Sheep, that the animals produced for Exhibition shall not have been grazed or fed, during the last season, in any way different from the rest of the *same class and age* in the flock to which they belong; and, with the exception of Shearling Ewes, no Ewes shall be allowed to compete but those which have reared Lambs the same season.

4. The boundaries of the Districts are very generally expressed, to enable Competitors to send Sheep to the Exhibition, who are within an attainable distance. The same Sheep, however, cannot draw the Premiums offered in more than one District in the same season.

5. The Competitions in 1845 will take place on such days between the 1st of June and 1st of November as shall be fixed by the Committee.

6. It is recommended to the Committee, as in the case of Cattle Competitions, to take the assistance of practical men as Judges in awarding the Premiums. The Judges, in deciding the Premiums for Sheep, will have regard both to the wool and carcass of the animal. The regulations for Cattle Shows, in regard to the previous intimations to Judges and Competitors—the placing of the stock, and the number of Competitors required for Competition—the power provisionally granted to make an allowance for Stock of merit in the event of deficiency in number, and prohibiting Members acting as Judges who are also Competitors—the regulations relating to extra expenses—the serving of the males within the District—and the manner in which the Reports are to be certified and transmitted, are severally hereby declared to be applicable to the Premiums for Sheep.

7. The Society gives these Premiums in alternate years for three Competitions in each District; and provided, during the intervening years, they are continued in the District, and Premiums are awarded by Proprietors or Local Societies, and duly reported to the Society, to an amount not less than one half of the Society's Premiums, and for the same descriptions of Stock, the Society will continue its Premiums to the District for an additional year, thus affording to the Districts the benefit of six continuous exhibitions.

II. SHEARING SHEEP.

With a view to promote improvement in the Shearing of Sheep, the Silver Medal will be given to the best Sheep-shearer in each of the Districts in which the Society's or local Premiums for Sheep are in operation.

CONDITIONS.

1. Local Associations, or others who propose to claim these Medals, must, on or before the 20th May 1845, lodge with the Society's Secretary, a satisfactory guarantee that Money Premiums will be awarded at each Competition to the amount of not less than L.2.

2. The District Conveners for the Sheep Premiums, with the aid of their Committees, shall fix the time and place of Competition, and make all necessary arrangements.

3. The Medal shall not be awarded in any case where there are fewer than four Competitors; and it shall always accompany the highest Money Premium. The Sheep shall be divided into lots of six, distinguished by numbers, and the lot to be shorn by each Competitor shall be determined by the number he draws from a set of Tickets marked with corresponding numbers. The whole shall commence on a given signal, a

person being appointed to note the time at which each competitor finishes his task. The Judges shall examine each lot in their separate pens; and if two or more lots appear to be equally well executed, preference shall be given to that executed within the shortest time.

4. The Conveners shall report the particulars of the Competition, and the award of the Judges to the Society, along with the Report of the award of the Sheep Premiums in the District.

III. WOOL.

FIRST SERIES.

Fleeces of pure bred Cheviot Sheep.

Class I.—1. For the best Fleece of a Shearling Cheviot Tup, smeared with tar and grease, or other substance with tar, and clipped in 1845—Five Sovereigns.

2. For the second best ditto—Three Sovereigns.

3. For the best Fleece of a Shearling Tup of *White* Cheviot Wool, or such as has been salved with grease only, or other substance without tar, and clipped in 1845—Five Sovereigns.

4. For the second best ditto—Three Sovereigns.

Class II.—5. On a comparison of the two best Fleeces in the first Class, for the best Fleece, judging relatively of their merits as to quality and weight, and also with reference to their management—Five Sovereigns.

Class III.—6. For the best Fleece of a Shearling Cheviot Ewe, smeared with Tar and grease, and clipped in 1845, being of a hill-fed breeding stock of not less than 150 Ewes—Five Sovereigns.

7. For the second best ditto—Three Sovereigns.

8. For the best *White* Fleece, or such as has been salved with grease only and no tar, clipped from a Shearling Cheviot Ewe in 1845, belonging to a breeding stock of not less than 150 Ewes—Five Sovereigns.

9. For the second best ditto—Three Sovereigns.

Class IV.—10. On a comparison of the two best Fleeces in the third Class, judging relatively of their merits as to quality and weight, and also in reference to their management, for the best Fleece—Five Sovereigns.

Fleeces of Cheviot Sheep crossed with Leicester.

Class V.—11. For the best Fleece clipped from a Shearling Wether in 1845, being the produce of a Cheviot Ewe, by a Leicester Tup—Five Sovereigns.

12. For the second best ditto—Three Sovereigns.

Class VI.—13. For the best Fleece clipped from a Shearling Ewe in 1845, being the produce of a Cheviot Ewe by a Leicester Tup—Five Sovereigns.

14. For the second best ditto—Three Sovereigns.

Class VII.—15. On a comparison of the best Fleeces in Classes II. and V., judging relatively of their merits as to quality and weight, and also in reference to their management, for the best Fleece—Six Sovereigns.

Class VIII. 16. On a comparison of the best Fleeces in Classes IV. and VI., judging relatively of their merits as to quality and weight, and also in reference to their management, for the best Fleece—Six Sovereigns.

Management of Fleeces.

Class IX.—17. For the Fleece of greatest merit in regard of general management, including washing, among the fleeces in the preceding Classes I., III., V., and VI., for which money premiums shall not have been awarded—Three Sovereigns.

18. For the Fleece second in merit—Two Sovereigns.

Note.—In all the Wool and Sheep Premiums by "Shearling Tup, Ewe, or Wether, in 1845," is meant a Sheep, the produce of 1844.

SECOND SERIES.

Fleeces of Highland or Black-faced Sheep.

Class I.—1. For the best Fleece of a Shearling Black-faced Tup, smeared with tar and grease, or other substance with tar, and clipped in 1845—Five Sovereigns.

2. For the second best ditto—Three Sovereigns.

3. For the best Fleece of a Shearling Tup of Black-faced Wool,

or such as has been salved with grease only, or other substance, without tar—Five Sovereigns.

4. For the second best ditto—Three Sovereigns.

Class II.—5. On a comparison of the two best Fleeces in the 1st Class, for the best Fleece, judging relatively of their merits as to quality and weight, and also with reference to their management—Five Sovereigns.

Class III.—6. For the best Fleece of a Shearling Black-faced Ewe, smeared with tar and grease, and clipped in 1845, being of a hill-fed breeding stock of not less than 150 Ewes—Five Sovereigns.

7. For the second best ditto—Three Sovereigns.

8. For the best Fleece of the Black-faced breed, salved with grease only, and no tar, clipped in 1845, from a shearling Ewe belonging to a breeding stock of not less than 150 Ewes—Five Sovereigns.

9. For the second best ditto—Three Sovereigns.

Class IV.—10. On a comparison of the two best Fleeces in the Third Class, judging relatively of their merits as to quality and weight, and also in reference to their management, for the best Fleece—Five Sovereigns.

Fleeces of Black-faced Sheep crossed with Leicester.

Class V.—11. For the best Fleece clipped from a Shearling Wether in 1845, being the produce of a Black-faced Ewe by a Leicester Tup—Five Sovereigns.

12. For the second best ditto—Three Sovereigns.

Class VI.—13. For the best Fleece clipped from a Shearling Ewe in 1845, being the produce of a Blackfaced Ewe by a Leicester Tup—Five Sovereigns.

14. For the second best ditto—Three Sovereigns.

Class VII.—15. On a comparison of the best Fleeces in Classes II. and V., judging relatively of their merits as to quality and weight, and also in reference to their management, for the best Fleece—Six Sovereigns.

Class VIII.—16. On a comparison of the best Fleeces in Classes IV. and VI., judging relatively of their merits as to quality and weight, and also in reference to their management, for the best Fleece—Six Sovereigns.

Management of Fleeces.

CLASS IX.—17. For the Fleece of greatest merit, in regard of general management, including washing, among the Fleeces in the preceding Classes I., III., V., and VI., for which Money Premiums shall not have been awarded—Three Sovereigns.

18. For the Fleece second in merit—Two Sovereigns.

RULES OF COMPETITION.

1. Competitors must be careful to indicate distinctly the particular Premiums for which they intend to compete, distinguishing them by their divisional denominations, their specifications, the classes in which they are offered, and the numbers prefixed to them; but no more than one Fleece can be exhibited in Competition for any one Premium.
2. Fleeces designed for Competition must be treated in all respects like the other Fleeces of the Flocks to which they belong.
3. In Classes I., III., V., and VI. in the divisions of Cheviot and Black Faced Wool and their crosses respectively, there must be at least three Competitors for each principal Prize, in order to the adjudging of the specified premiums; but in case of deficiency in this respect in any instance, it shall be allowable for the Judges to award to the Exhibitor of a Fleece of merit a sum not exceeding one-half of the first Premium; and, in all the Classes, it shall be at the discretion of the Directors, on the recommendation of the Judges, to present a limited number of Silver Medals to such Competitors as may fail to obtain Money Premiums, but may nevertheless appear to be deserving of this mark of distinction. But the proposal of a Medal in a Primary Class will not constitute a qualification for Competing in a Comparative Class, though it will form no bar to Competition in Class IX. of the appropriate series. Fleeces, however, in the Primary Classes for which portions only of the specified Premiums may be awarded in consequence of deficiency in the number of Competitors, will be allowed to Compete in the Comparative Classes.
4. The Competition in Classes I. and III. in the division of Cheviot Wool, is expressly restricted to specimens of Wool, fairly understood and admitted to be the growth of Sheep of the true Cheviot breed; and each Fleece must be accompanied by a declaration in writing, attested by a motto or mark selected by the Exhibitor (to be eventually substantiated by his proper signature,) that to the

best of his knowledge and belief, the Stock from which the Fleece is taken is free from any mixture of Leicester, Black-Faced, or other cross. In like manner, the Competition in Classes V. and VI. in the division of the Cheviot and Leicester Cross, is limited to Wool clipped from Sheep of the specified cross of a Leicester Tup and a Cheviot Ewe; and along with each Fleece, in these two Classes, must be transmitted a corresponding declaration similarly attested, and subject to the same condition of eventual verification.

5. In Classes I. and III., in the division of Black-Faced Wool, the competition is declared to be limited to specimens of Wool fairly understood and admitted to be the growth of Sheep of the true Black-Faced breed; and each Fleece must be accompanied by a written declaration, attested by the motto or mark of the Exhibitor (to be eventually substantiated by his proper signature,) that to the best of his knowledge and belief, the Stock from which the Fleece is taken is free from any mixture of Leicester, Cheviot, or other cross. The Competition in Classes V. and VI., in the division of the Black-Faced and Leicester cross, is in like manner confined to wool clipped from Sheep of the specified cross of a Black-faced Ewe and a Leicester Tup, and along with each Fleece in these two Classes must be transmitted a corresponding declaration similarly attested, and subject to the same condition of eventual verification.
6. In judging of the quality of the Fleeces, the points to be taken into consideration are the fineness, trueness, soundness, softness, and elasticity of the fibre, combined with proper length of staple. But it is to be clearly understood that no Fleece which shall be ill got up, or, in other words, disfigured by clotted locks, decayed wool, or other imperfection that ought obviously to be removed previously to winding, will be deemed to entitle the Exhibitor to a Premium in any Class.
7. Competitors to whom Money Premiums may be adjudged, or who may be considered to be deserving of Silver Medals, are required to furnish, *on application*, information respecting the extent and general system of management of the Flocks from which the Prize Fleeces shall have been taken, including, so far as practicable, the time and mode of washing, the period and method of clipping, the elevation and character of the pasturage, the means of support in winter and spring, the price per stone (mentioning the number of pounds contained in it) of the clip last sold, the price per score obtained for three years old sheep, the size of the sheep, denoted by the average weight of quarter of a three years old wether, and what proportion the average Fleeces of the Flocks bear in point of quality and weight to the specimens presented.

8. Fleeces intended for Competition must be delivered at the Society's Museum, George IV. Bridge, Edinburgh, on or before Wednesday the 3d day of September 1845; and no Fleece will be admissible to compete which shall not have been lodged at the Museum, and entered on the Conservator's Register before six o'clock in the evening of that day. Each Fleece must be enclosed in a bag, marked with the selected motto or mark, and the same motto or mark must be affixed by a card to the Fleece. A *sealed letter*, containing the name and address of the Competitor, and bearing on the back the motto or mark attached to the Fleece, must also be enclosed in the bag; but *this letter* will not be opened unless a money Premium shall be awarded, or a Silver Medal recommended, in favour of the Exhibitor. The descriptive statement, prescribed in Rule I. of the particular Premium for which competition is designed, and the attested declaration of the breed of the Sheep, required by Rule IV. or V., as the case may be, must likewise be contained in the bag, written on an open paper.

9. Fleeces presented for Competition, but disqualified from competing, owing to want of compliance with the "Rules of Competition," and Fleeces for which money Premiums may not be awarded, will be restored to the owners, provided application shall be made for them, at the Society's Museum, within three months from the date of the Advertisement, in the North British Advertiser, announcing the awards.

10. After the delivery of the Fleeces at the Museum, the whole responsibility and care of weighing them, and judging as to their merits, will devolve upon the Directors, who, for their own satisfaction, as well as the public benefit, have resolved, in this branch of Premiums, to engage the services and assistance of professional Woolstaplers and persons of known character and experience in the examination of Wools. Their object is to have the Competition conducted under the superintendence of a Committee of themselves, and in a manner proportionate to the importance they attach to the subject, which they have reason to believe is not yet sufficiently understood or adequately appreciated in this country.

FORMS TO BE OBSERVED BY COMPETITORS IN TRANSMITTING FLEECES FOR COMPETITION.

No. I.—Pure Bred Cheviot Sheep.

Class I.—3. For the best Fleece of a Shearling Tup, of *White* Cheviot Wool, or such as has been Salved with Grease only

or other substance, without Tar, and Clipped in 1845—Five Sovereigns.

DECLARATION.

It is hereby declared, that, according to the best of my knowledge and belief, the Fleece marked "Ajax," and designed to compete for the Premium specified above, was Clipped in 1845, from a Shearling Tup, of pure Cheviot Breed, belonging to a stock free from any mixture of Leicester, Blackfaced, or other cross.

"AJAX."

NO. 2. CHEVIOT SHEEP CROSSED WITH LEICESTER.

CLASS. V.—11. For the best Fleece clipped from a Shearling Wether in 1845, being the produce of a Cheviot Ewe by a Leicester Tup—Five Sovereigns.

DECLARATION.

It is hereby certified, that, according to the best of my knowledge and belief, the Fleece marked "Orion," and designed to compete for the Premium specified above, was clipped in 1845 from a Shearling Wether, the produce of a pure Cheviot Ewe by a true Leicester Tup. "ORION."

NO 3. HIGHLAND OR BLACK FACED SHEEP.

CLASS III.—8. For the best Fleece of the Black Faced Breed, salved with grease only, and no tar, clipped in 1845 from a Shearling Ewe belonging to a breeding stock of not less than 150 Ewes —Five Sovereigns.

DECLARATION.

It is hereby certified, that, according to the best of my knowledge and belief, the Fleece marked "Minerva," and designed to Compete for the Premium specified above, was clipped in 1845 from a Shearling Ewe of the true Black Faced breed belonging to a breeding stock of not less than 150 Ewes, free from any mixture of Cheviot, Leicester, or other cross. "MINERVA.

NO. 4. BLACK-FACED SHEEP CROSSED WITH LEICESTER.

CLASS VI.—13. For the best Fleece, clipped from a Shearling Ewe in 1845, being the produce of a black-faced Ewe by a Leicester Tup—Five Sovereigns.

DECLARATION.

It is hereby certified, that, according to the best of my knowledge and belief, the Fleece marked "Juno," and designed to compete for the premium specified above, was clipped in 1845 from a Shearling Ewe, the produce of a pure black-faced Ewe by a true Leicester Tup.

"JUNO."

NOTE.—In the Classes in which examples are not given in the preceding forms, the slight modifications required by the terms of the Premiums will of course be necessary in the specifications and declarations.

§ IV. SWINE.

PREMIUMS FOR IMPROVING THE BREED OF SWINE.

DISTRICT.

Mull, Morven, and Ardnamurchan.

1. For the best Boar, not under twelve months, and not exceeding four years old, *bona fide* the property, and in possession of any Proprietor or Tenant in the said District, in autumn 1845—Five Sovereigns.
2. For the second best—Three Sovereigns.
3. For the best Breeding Sow of the same age—Four Sovereigns.
4. For the second best—Two Sovereigns.

These Premiums to be awarded for animals that are considered most profitable, and best suited for the purpose of curing mess Pork. Attention is recommended to the introduction of the Berkshire or Suffolk breed of Swine, as being the best for curing Pork.

It is a condition of the offer of the Premiums that Five Sovereigns shall be contributed by the District.

The Competition will be held at Tobermory, at such time as the Society's Members resident in the District shall fix, at a meeting to be called by the Convener for the purpose, on or before the 1st of June. This meeting is also authorised to name a Committee for managing all details, and to fix the necessary regulations for Competition. A Report of the award of the Premiums, with a copy of the Regulations of Competition, to be transmitted to the Secretary on or before the 10th of December 1845.

Colonel Campbell of Possill, in his absence, John Stewart, Esq. of Achadashenaig, to be Convener.

CLASS VI.

PRODUCTS OF LIVE STOCK.

DISTRICT.

The Counties of Inverness, Ross, Cromarty, Moray, and Nairn.

The Premiums given, and regulations suggested, for promoting an improved system of Curing Butter and Making Cheese, having been productive of highly satisfactory results, the following Premiums are offered in the above District in 1845, the competition to take place at Inverness—Ten Sovereigns in part of the Premiums being contributed by the District.

I. CURING BUTTER.

1. To the owner of any Dairy in the said District who shall make and cure the best quality of Butter for the market, not being less than one cwt., (112 lbs. the cwt., and 16 oz. the lb.,) during the season 1845—Six Sovereigns.
2. For the second best quality as aforesaid—Four Sovereigns.
3. For the third best quality as aforesaid—Three Sovereigns.
4. For the fourth best quality as aforesaid—Two Sovereigns.

II. MAKING CHEESE.

1. To the owner of any Dairy in said District who shall make for sale, and exhibit at a Competition at Inverness, the best quality of Cheese from Sweet or Full Milk, the quantity made not being less than 2 cwt.—Five Sovereigns.

For the second best quality of ditto—Three Sovereigns.

To the owner of any Dairy in said District who shall make for sale, and exhibit at a Competition at Inverness, the best quality of Cheese from Skimmed Milk, the quantity made not being less than 2 cwt.—Five Sovereigns.

For the second best quality of ditto—Three Sovereigns.

CONDITIONS.

The Butter must be certified to have been made and cured on the Competitor's farm during the season 1845, and the whole quantity produced at the Competition must not

be less than one cwt. The certificate must be supported by the declaration of the Exhibitor. The Butter shall be inspected by a Committee of the Members of the Society resident within the district. The Committee, at a meeting to be called by the Convener for that purpose, shall fix such general regulations as they may consider proper; and they will, in particular, fix the day of Competition. The quality of the Butter to be tested by judges to be named by the Committee, in the way usually done by purchasers in the public market. In the event of two or more competing lots being deemed equal in quality, the Premium will be awarded to the Competitor who shall have cured the larger quantity. Although not required as a condition, it is strongly recommended, as affording facilities for sales, that the Butter should be packed in firkins containing 56 lb. each, or in earthen vessels which have not been glazed with preparations of lead, and of such size as may be suitable for sales. It is also suggested that the vessels containing the samples of Butter, should be of such form as to admit of their contents being easily turned out for inspection. The successful candidates, before receiving the Premiums, are required to transmit to the Secretary a detailed report of the whole process followed by them in the manufacture of their Butter.

It must be certified that the Cheese has been made on the Competitor's farm in 1845; and that the sample produced is a fair average specimen of the produce of the Dairy in that year. The conditions as to the general arrangements, time of Competition, and other particulars, to be the same as those above provided in regard to the Butter Premiums, in so far as these are applicable.

Reports of the award of the Premiums to be lodged with the Secretary of the Society, on or before the 10th December 1845.

John Macpherson Grant, Esq. younger of Ballindalloch, to be Convener of the Society's resident Members.

CLASS VII.

COTTAGES.

1. PREMIUMS FOR THE BEST KEPT COTTAGES AND GARDENS.

In order to encourage Cottagers to keep their cottages and gardens neat and clean, the following Premiums will be given in the parishes after-mentioned. One-half of the Premiums is given by the Society, and the other half is contributed by the Members, or others, who applied for the Premiums.

Mid-Lothian.

1843—Parish of Kirkliston.—Convener, Sir Alexander C. Maitland Gibson, Bart. of Cliftonhall.

1843—Parish of Newton.—Convener, John Wauchope, Esq. of Edmonstone.

1843—Parish of Penicuick.—Convener, Hugh H. Brown, Esq. of Newhall.

The Islands of Zetland.

1842—Parish of Tingwall.—Convener, William Hay, Esq. of Laxfrith.

County of Caithness.

1842—Parish of Latheron.—Convener, Donald Horne, Esq. of Langwell.

County of Dumfries.

1843—Parish of Kirkpatrick Juxta.—Convener, J. J. Hope Johnstone, Esq. of Annandale, M.P.

1843—Parish of Applegarth.—Convener, Sir William Jardine, Bart. of Applegarth.

1843—Parish of Middlebie.—Convener, E. Bradshaw Smith, Esq. of Blackwood House.

Stewartry of Kirkcudbright.

1844—Parish of Carsphairn.—Convener, Colonel Macadam Cathcart, of Craigengillan.

1844—Parish of Kells.—Convener, William Grierson Yorstoun, Esq. of Garroch.

1844—Parish of Dalry.—Convener, William Forbes, Esq. of Callander, M.P., or his Factor, in his absence.

1844—Parish of Balmaclellan.—Convener, Walter Dickson, Esq. of Monybuie.

1844—Parish of Crossmichael.—Convener, John Hall, Esq. of Mollance.

County of Argyll.

1842—District of Ardnamurchan.—Convener, Sir James M. Riddell, Bart., and in his absence, his Factor.

1842—District of Morven.—Convener, Sir Charles Gordon of Drimnin.

1842—District of Kingerloch.—Convener, C. H. Forbes, Esq. of Kingerloch.

1842—District of Ardgower.—Convener, Colonel Maclean of Ardgower.

County of Berwick.

1842—Parish of Hutton.—Convener, W. F. Home, Esq. of Paxton.

1842—Parish of Eyemouth.—Convener, Sir Samuel Brown of Netherbyres, in his absence, James Renton, Esq. of Greystonelees.

1842—Parish of Coldingham.—Convener, John Campbell Renton, Esq. of Mordington.

1842—Parish of Coldstream.—Convener, Rev. Mr. Goldie, Coldstream.
1844—Parish of Fogo.—Convener, Richard Trotter, Esq. of Mortonhall.
1845—Parish of Polwarth.—Sir H. Hume Campbell, Bart., M.P.

County of Forfar.

1843—Parish oe Kettins.—Convener, Robert Pillans Newton, Esq. Hallyburton.

Islands of Orkney.

1843—Parish of St. Ola.—Convener, William Balfour, Esq. of Trenabie.
1843—Parish of Shapinshay.—Convener, David Balfour, Esq. younger of Trenabie.
1844—Parish of St. Andrews.—Convener, James Baikie, Esq. of Tankerness.
1844—Parish of Stennis.—Convener, William Balfour, Esq. of Trenabie.

County of Peebles.

1844—Parish of Innerleithen.—Convener, the Earl of Traquair.
1844—Parish of Traquair.—Convener, the Earl of Traquair.

PREMIUMS.

1. For the best kept Cottage in each of the said Parishes—Two Sovereigns; and in addition, where there shall not be fewer than five Competitors—The Cottage Medal.

2. For the second best kept ditto—One Sovereign.

3. For the best kept Cottage Garden in each parish—One Sovereign.

CONDITIONS.

1. The Cottages may either be single or in villages. The names of intending Competitors may be intimated to the Conveners appointed by the Society, on or before the 20th of June next, and it shall then be competent to the Conveners to add to the list the names of such other individuals as they may think deserving of being brought forward; but after that day, no new name shall be admitted; and in every case the occupiers of Gentlemen's Lodges, and Gardener's Houses shall be excluded. The inspection of the *Cottages* and *Gardens* to take place between 20th June and 12th September. And, in making the inspection, the Conveners shall have power to take the assistance of any of the Members of the Society, or of any competent judge.

2. In order to authorise the awarding of the Premiums, the annual value of the Cottage of the Competitor, with the ground annexed, must not exceed £5 sterling, and there must at least be two Competitors in the District. No Cottage or Garden for which a Premium has been awarded by the Society, will be admitted in competition again for the same or a lower Premium. If the Cottage competing is occupied by the Proprietor, the roof must be in good repair. If the roof is of thatch, it must be in good repair, though in the occupation of a tenant. The windows must be free of broken glass, and perfectly clean, and must afford the means of ventilation. Dunghills and all other

nuisances must be removed from the front and gables, and the privy, where there is one, must be kept clean. The peat-stacks, if any, must be so placed as not to be a deformity; and the interior of the Cottage must be as cleanly kept as the nature of the Cottage admits of. In awarding the Cottage Premiums, the preference will be given to those who, in addition to these requisites, have displayed the greatest taste in ornamenting the exterior of their houses, with the ground in front and at the gables. In the event of there being only one Competitor, it will be in the power of the Committee to award one-half of the premium, if the merits of the Cottage shall appear to be such as to deserve it.

3. In estimating the claims of Competitors for the Garden Premium, the Judges will have in view, 1st, The sufficiency and neatness of the fences; 2d, The cleanness of the ground, and neatness of the walks; 3d, The quality of the crops, and general productiveness of the Garden; and, 4th, The choice of crops. Much advantage is derived in some districts of Scotland, from Cottagers cultivating, besides the more common crops, a portion of early potatoes along with the late, of early cabbage, early pease, cauliflower, lettuce, with some gooseberry and currant bushes, and a fruit-tree trained against the wall, &c.

4. Reports, stating that the various particulars before mentioned have been attended to, the number of Competitors, the names of the successful parties, and the nature of the exertions which have been made by them, must be transmitted by the Conveners to the Secretary of the Society, on or before the 10th day of October next.

5. The Premiums are given for four successive years in each parish. In any parish where the Convener may think it unnecessary to continue them for so long a period, he is requested to state this in his annual Report, and the Directors will be guided by his recommendation. When the Convener shall neglect to make a Report, or to assign a satisfactory reason for there being no Competition, the name of the parish shall in the following year be struck off the list.

6. Similar Premiums will be given for four successive years in eight additional parishes, according to priority of application, on condition that a satisfactory guarantee for one-half of the amount of the Premiums to be given, shall be lodged by each parish with the Secretary, on or before the 1st of January 1846.

2. BEE HUSBANDRY.

If any of the above mentioned parishes shall wish to have a Premium instituted for promoting the cultivation of Bees among the peasantry, Ten Shillings will be granted annually for that purpose from the funds of the Society, also for a period of four years, on a guarantee for the like amount being received from the parish making the application. The conditions of competition will be arranged hereafter. The Competitor will be preferred who shall, in the course of the season, have raised the greatest number of hives of Bees, not under four, from stocks, whether the property of the Competitor or belonging to others. If the numbers are equal, the preference will be given to those which have been best managed.

3. MEDALS TO COTTAGERS.

In the view of giving still farther encouragement to Cottagers of the description referred to under the first branch of this Class, who do not reside in Parishes in which the regular Premiums are in operation, and at the same time of giving aid to Local Associations and public-spirited individuals, establishing or continuing at their own expense Premiums for the like objects, the Society will give its Cottage Medal to such Associations or public-spirited individuals as apply for the same, and may be desirous to add that testimony of approbation to such premiums, as they themselves bestow. The number of Medals to be issued annually is limited to twelve.

Application for these Medals, stating the nature and amount of the encouragement which is to be afforded by the parties applying, to be made to the Society on or before the 1st of July in each year, so that the Association or individual making the application may be enabled to intimate that the Medals are to be given. The Medals will afterwards be issued upon a Report, certified in the terms required by the preceding conditions, describing the merits of the Cottagers. The Reports to be lodged with the Secretary before the 10th November of the year in which the application is made.

4. PREMIUMS TO PROPRIETORS FOR BUILDING AND IMPROVING COTTAGES.

1. *The County of Haddington.*
2. *The County of Inverness.*

In order to mark the sense which the Society entertains of the advantages likely to result to the country, by Landed Proprietors exerting themselves to improve the style and comfort of Cottages on their estates; and in order to call the attention of such Proprietors to the subject, the Society proposes to give the following Premiums:—

1. FOR BUILDING COTTAGES.

1. To the Proprietor in each of the said districts who shall erect on his estate, during the years 1845 or 1846, the best and approved Cottage—The Honorary Silver Medal.

2. To the Proprietor in each of the said districts who shall have erected on his estate, during the years 1843, 44, 45, and 1846, the greatest number of approved Cottages—The Gold Medal.

2. FOR IMPROVING EXISTING COTTAGES.

3. To the Proprietor in each of the said districts who shall have improved and enlarged, where necessary, during the years 1844, 1845, and 1846, the greatest number of his existing Cottages—The Gold Medal.

Any District.

4. To the Proprietor in any district in Scotland who shall improve and enlarge where necessary, during the years 1845, 1846, and 1847, five or more of his existing Cottages—The Gold Medal.

The claims of intending Competitors for the Premium, No. 1, must be lodged with the Conveners of the Committee of the Society in the said Counties, on or before the 1st of October in the year in which the claims are made, otherwise they will not be entitled to compete; those for the Premiums Nos. 2 and 3 in the same manner, on or before the 1st of October 1846; and those for the Premium No. 4 in the same manner, on or before the 10th of October 1847. The inspection of the Cottages to take place between the 1st October and the 1st November in the year in which the claim is made, for the Premium No. 1; between the same dates in the year 1846 for the Premiums Nos. 2 and 3; and between the same dates in the year 1847, for the Premium No. 4.

Reports by the Conveners to be transmitted to the Secretary of the Society on or before the 30th of November in each year.

In order to authorise the award of the Premiums, the annual value of the Cottage or Cottages separately, with garden-ground, must not exceed L.5, and in awarding the Premium No. 2, the Cottage for which the Premium No. 1 has been awarded, shall be deducted from the number.

In estimating the claims of Competitors, the following points will be kept in view.—1st, The situation of the Cottage with reference to amenity of climate and aspect, and to the means of drainage, ventilation, and of preserving cleanliness. 2d, The suitableness of the structure to withstand the effects of the climate of the district. 3d, The accommodation in the interior of the Cottage, and the arrangement of the out-houses, more especially the privy and the ash-pit, which must be as much as possible out of sight, and screened by a few trees or shrubs. No Cottage without a privy to be entered for Competition. 4th, The small expense of the building, &c. compared with its durability, and with the accommodation afforded, and calculated with reference to the price of materials, and other circum-

stances, which may vary in different districts. 5th, The outward appearance of the Cottage or Cottages. When it appears that the Cottages of one Competitor are superior in point of style and comfort to those of another, though not so numerous, the Inspectors to give the preference to the former, provided that they amount at least to the number of five, and have been erected at a moderate expense.

Parties competing to forward plans, specifications, and estimates, to the Society, through the Conveners of the Districts, from which, and of all information sent therewith, copies may be taken for publication, if the Society shall see fit, and the originals returned to the parties within six months, if desired.

The Members of the Society in the respective Counties, or in the neighbourhood of the Cottages competing, are appointed Committees to inspect the Cottages, and report on the claims, with power to name Sub-Committees.

For the First District.—Sir George Grant Suttie, Bart., of Prestongrange, to be Convener.

For the Second District.—James M. Grant, Esq. of Glenmoriston, and John Stewart, Esq., of Belladrum, to be Conveners.

5. USE OF THE SPADE.

The Society, with the view of promoting dexterity in the use of the Spade, will give the following Premiums in the parishes after mentioned, viz.

Mid-Lothian.

1842—Parish of Penicuik.—Convener, Sir George Clerk of Penicuik, Bart.; in his absence, Mr. Maclean, Braidwood.

Dumfriesshire.

1843—Parish of Middlebie.—Convener, E. Bradshaw Smith, Esq., of Blackwood House.

1844—Parish of Canobie.—Convener, George Scott Elliot, Esq., of Larriston.

Perthshire.

1844—Parish of Redgorton.—Convener, Robert Graham, Esq. of Balgowan.

PREMIUMS.

For the best specimen of Spade Work in each of these Parishes, at a competition between not fewer than twelve Competitors—the sum of £1, 5s.

For the second best, 15s.

For the third best, 10s.; And 30s. will be at the disposal of the Convener and Committee, for division among the unsuccessful Competitors.

CONDITIONS.

At least one month before the day of Competition, the time and place of competition, the quantity of ground to be turned over by each Competitor, the depth to which it is to be dug, the manner in which the spits are to be laid, and the time to be allowed for the performance of the work (which, in all cases, care will be taken shall be ample,) shall be fixed and declared by the Convener; and, where practicable, the Convener shall, by the same time, have dug, in a central situation, a piece of ground affording a sufficient specimen of the manner in which the work is to be performed, which is to be done by the spade only, and not by the shovel. The Convener shall decide the Premiums with the assistance of such other members of the Society as may attend. Failing the attendance of more than one Member, the assistance of competent judges to be taken. In case of perfect equality, the preference to be given to the Lot which is first finished. Gardeners and persons who have gained first Premiums to be excluded from competing. The Competitions must take place on or before the 11th of November next, and be reported to the Secretary of the Society on or before the 1st December following. Any parish failing to report within the time specified, will forfeit the benefit of the Premiums in future years.

The like Premiums will be given in four additional parishes in the year 1846, and three succeeding years, on guarantees to the amount of half of the Premiums offered being lodged with the Secretary by the parties making the application, on or before the 1st of January next.

NOTE.—These Premiums are proposed chiefly for the benefit of Districts in which there is a redundant population.

In order that the Premiums offered may be made known to the industrious Cottagers, the Society trusts much to the obliging co-operation of the Clergy in the Counties in which the Cottage Premiums are offered.

CLASS VIII.

WOODS AND PLANTATIONS.

1. HONORARY PREMIUMS FOR EXTENSIVE PLANTING.

To the Proprietor who shall, within a period of five years immediately preceding, have planted on his property the greatest extent of ground, not being less than 150 acres, and who shall communicate to the Society, on or before the 10th of November in any year, a satisfactory report of his operations, embracing the expense, description of soil, age, and kind of trees planted, the number of each sort

per acre, mode of planting, extent of "beeting up," and general progress of the plantation, with such observations as his experience may suggest—The Gold Medal.

Although not required as a Condition, it will be a recommendation that the report contain a notice of the underlying rocks, and of the geological features of the district.

2. REPORTS ON RECENT PLANTATIONS.

To the Proprietor who shall communicate to the Society, on or before the 10th of November in any year, the most satisfactory Report on the Planting of Land, founded on experiment; and who shall accordingly have planted on his own property an extent of not less than fifty acres, within a period of not more than ten nor less than four years preceding the date of his Report—The Gold Medal.

The Report should comprehend every interesting particular: among others, the exposure and altitude of the place, and general character of the soil—whether lime has been used, and, if so, its mode of application and apparent effect—the same of any sort of manure or other fertilizing substance—the mode of fencing and of planting adopted—the kind of trees planted, and the number of each kind per acre—their relative progress—the proportion of blanks or deaths at the end of three years—the state of the plantations at the date of making the report—and the expense per acre, as nearly as can be calculated.

3. ON PLANTING WITHIN THE INFLUENCE OF THE SEA, OR ON EXPOSED BARREN TRACTS.

The Gold Medal, or Plate of the same value, will be given for an approved Report on successful Planting within the influence of the sea, or on very bleak, peaty, or sandy tracts; the Report being founded on observation of the habits and appearance of the different sorts of trees considered as best suited for such situations.

Great disappointment having arisen to landed proprietors, in different parts of this country, in planting Waste Grounds, especially on the sea coast, the above premium is offered, with a view of directing attention to the subject.

Information is particularly desired regarding trees calculated for growing in situations unfavourable to the health of most of the more generally cultivated sorts, as in bleak heaths, barren sandy links, and

exposed maritime situations; and, with respect to the last of these, the value of the *Pinus Pinaster*, or the more hardy variety of that tree from the downs of Bourdeux, (called *Pinus maritima minor*,) should be ascertained.

The Reporter is requested to specify the nature not only of the surface soil, and although not required as a Condition, it would be a recommendation that the Report contain a notice of the underlying rocks, and of the geological features of the District reported on; with its elevation, exposure, and distance from the sea.

Reports to be lodged on or before the 10th November in any year.

4. FORMATION OF ARBORETUMS.

To the Proprietor in Scotland who shall, on or before the 10th of November in 1845, or in any subsequent year, submit to the Society an approved report of his having planted the most varied, extensive and judiciously arranged collection of hardy, or supposed hardy, forest and ornamental trees—either *species* or marked *varieties*—Twenty Sovereigns, or a piece of Plate of that value.

There is reason to believe that important arboricultural knowledge may be obtained by the judicious formation of Arboretums in various parts of the country, where opportunities may be afforded of comparing the growth and habits of the different species and varieties of Hardy Trees. It is required, therefore, that such Arboretum shall be formed, so as to afford proper space for the future development of each specimen. The Report must specify the date of planting, with the age and height of each specimen at that time. It must also state whether the tree is a seedling, a cutting, a layer, or a grafted plant; and if the latter, on what stock it had been grafted. Information must be afforded relative to the nature and previous preparation of the soil, the altitude and exposure of the place; mentioning also, whether it be in the vicinity of a large town, manufactory, lake, or marsh, where smoke or hoar frost may be supposed to exert their influence on the growth of the plants generally, or on any particular section or sections of them. Any means used for protecting or fencing the Arboretum should be stated.

The Report must be accompanied with a correct plan of the Arboretum, on a scale of not less than two inches to the chain, showing the relative disposition of each specimen, which may be marked on the plan thus (2), the figure in the centre corresponding with that attached to the name contained in the Report, or in an accompanying List. In cases where such a plan cannot well be made, (as, for

example, when an Arboretum is formed on the sides of an approach to a mansion-house, which will often be found an admirable locality for the purpose,) an accurate description of the distribution and arrangement of the trees must be given.

5. NATURAL LARCH FORESTS.

The Gold Medal will be given for the best and approved report, founded on actual observation, relative to the state of the Larch Forests of Switzerland and the Tyrol.

The above Premium is offered with a view of ascertaining the description of soils, situations, &c., in which the Larch naturally attains to the greatest perfection.

Reporters are, therefore, required to describe the nature of the soil, subsoil, and underlying rocks on which the finest natural Larch timber is produced, together with the climate, altitude, and exposure of such localities. As also, what diseases and insects are most injurious to the health of the trees, and under what circumstances these are most prevalent. It is farther desirable, that Reporters state whether any difference has been observed in the quality of Larch Timber grown on different soils, or in that of different varieties of trees distinguished by their foliage, habit of growth, colour of flower, or otherwise. Also, whether the diseases termed *Rot* and *Canker,* (Loudon's Arboretum Britannicum, pages 2385 and 2387,) so prevalent in various parts of Britain, are known in the natural forests; and, if so, on what soils, and under what circumstances, these diseases are most injurious.

Reports to be lodged on or before the 10th of November 1845.

6. DISEASES OF THE LARCH.

Twenty Sovereigns, or a piece of Plate of the same value, will be given for the best and approved report on the Diseases which prevail in the Larch Plantations of Scotland.

The writer is required to describe the different diseases commonly called *heart rot*, *canker*, and *white bug*, and to state the manner in which they appear to affect various parts of the plant, as the root, the trunk and bark, the leaves, and the fruit or cones. He is required to direct attention to the annual layers in the wood of trees that have been felled, so as to ascertain, if possible, the period or year in which a decay of vigour first exhibited itself in the plants affected.

The writer is farther requested to state the age of the trees at which

the diseases most generally manifest themselves; the situations in which they have chiefly appeared, with respect to the geological formation; the wetness, dryness, stiff nature, or other conditions of the soil or subsoil; elevation, exposure, checks of growth from pruning or other causes; and evils arising from inattention to proper thinning; and to mention whether the larch had been planted soon after a previous crop of Scotch fir or other timber had been removed from the ground. He is especially required to observe, whether, and under what circumstances, trees have, in any case, escaped injury, or whether from any obvious cause the diseases, after appearing, have spontaneously ceased; and he is requested to ascertain, as far as possible, the kinds of seed that have been used, whether they have been derived from the cones of trees cultivated in this country, or procured from the forests of Switzerland and the Tyrol.

Farther, as it is highly important to ascertain if any means exist of averting the progress of decay, and restoring the vigour of the trees affected, experiments with this view will be considered with especial favour.

The Report must be accompanied with such specimens of the timber, soils, rocks, &c., as may tend to illustrate any particular remarks or opinions of the author.

Reports to be lodged on or before the 10th of November 1845.

7. FOREST TREES.

For the best and approved Report of useful Forest or Timber Trees, now existing, or recently cut down, within the Counties of Aberdeen, Forfar, Banff, and Kincardine—The Medium Gold Medal.

It is required that the Report shall embrace at least ten different species of trees. The principal object being to ascertain what kinds are likely to be most successful and profitable in various situations. The Report must specify correctly the species of trees, the nature of the soil and of the sub-soil, and rock, strata, or geological formation; the distance from the sea, and height above its level; with the nature or aspect of the situation generally; the age of the trees as nearly as this can be given; the progress of growth (if observed) for every ten or five successive years; the size, particularly the girth, at three feet from the ground; the height and cubic contents; and, where the trees have been felled, the quality of the timber, and the uses to which it is chiefly applicable.

Information is desirable as to perasitical plants and insects which affect

the same sorts of trees in different localities, and at different ages; and notices regarding remains of Forest Trees found in the peat mosses of the districts will be interesting.

Reports to be lodged on or before the 10th of November 1845.

8. ON RECENTLY INTRODUCED CONIFERÆ.

To the person who shall, on or before the 10th of November in any year, submit to the Society an approved Report on the results attending his culture of the recently introduced Coniferous Trees—The Gold or Silver Medal, according to circumstances.

It is the wish of the Society to ascertain how far the various recently introduced kinds of the Pine or Fir Tribe are likely to prove either useful or ornamental trees in the climate of Scotland; such as *Cedrus Deodara* and *Pinus excelsa*, from Nepaul; *Abies Douglasii* and *A. Menziesii*, from North West America and California; *Araucaria imbricata*, from Chili; and *Pinus Austriaca*, or Black Pine, and *Pinus Cembra Helvetica*, or Swiss Stone Pine. Information is therefore desired as to the Soils and exposures which seem best adapted for these different species, or as many of them that have been cultivated by the Reporter; also as to the advantage of sheltering any of them while young, by means of Scotch Firs, or Spruces, as nurses. Comparative statements should be given, as far as possible, between their respective progress in growth and that of the more commonly cultivated sorts, such as Scotch Fir, Larch, Spruce, and Silver Fir; and their comparative general qualities, as forest or ornamental trees, should also be mentioned.

9. MORE EXTENDED INTRODUCTION OF KNOWN SPECIES OF THE FIR TRIBE.

To the person who shall, within six years from 1842, inclusive, have introduced from any part of the world, seeds capable of germination, the produce of hardy species of the Fir Tribes which have been already introduced into Britain, but of which only a few plants have been raised—The Gold or the Silver Medal, or a piece of Plate of such value as the Directors may, in the circumstances of the case, deem adequate.

It is required that the quantity of seeds of each species imported shall be sufficient to afford at least 250 seedling plants; and farther, that before the Premium be awarded, the number of seedling plants of

each species actually raised in Scotland, shall not be less than 50. Attention is particularly directed to *Araucaria imbricata*, *Pinus ponderosa*, *Lambertiana*, and *Sabiniana;* to *Abies Douglasii nobilis*, *grandis*, and *Menziesii;* and to *Taxodium sempervirens* which last is abundant in the vicinity of St. Francisco, and throughout the low sandy plains of California. Intending Competitors are referred to the Premium No. 22, Class I., Essays and Reports, as to the manner in which seeds ought to be transmitted to this country. Reports to be lodged by 10th November 1848.

CLASS IX.

THE GENERAL SHOW OF LIVE STOCK,

AND

AGRICULTURAL MEETING AT DUMFRIES IN 1845.

The Society having resolved to hold the General Show of Live Stock, and Agricultural Meeting for 1845 at Dumfries, the following Premiums are offered to be then awarded by the Society, aided by liberal donations from Noblemen, Gentlemen, and Agricultural Associations in the Counties more immediately interested, and from the Town of Dumfries.

The Competition is open to Stock from every part of the United Kingdom. The Show will take place on the 7th, 8th, and 9th of October.

The arrangements will be :—

Tuesday, 7th October.—The Exhibition of Agricultural Implements, Dairy Produce, Roots, Seeds, and Plants.

Wednesday, 8th October.—The General Show of Cattle, Horses, Sheep, Swine, and the whole of the articles enumerated above, exhibited on Tuesday.

Thursday, 9th October.—The Exhibition of the Prize Stock, Implements, and other articles.

§ I. CATTLE.

GALLOWAY BREED.

Class I. For the best Bull calved between 1st January 1839 and 1st January 1843—Thirty Sovereigns.

For the second best ditto—Fifteen Sovereigns.

To the Breeder of the best Bull in this Class, the Honorary Silver Medal.

II. For the best Bull not exceeding thirty-three months old—Ten Sovereigns.

> It is a condition attached to the above Premiums, that the Prize Bulls shall serve in the district, comprehending the counties of Dumfries, Kirkcudbright, and Wigton, for the season of 1846.

III. For the best two Breeding Cows, belonging to the same stock, calved prior to 1st January 1843—Fifteen Sovereigns.

IV. For the best single Breeding Cow, calved prior to 1st January 1843—Ten Sovereigns.

For the second best ditto—Five Sovereigns.

V. For the best two Spayed Heifers, calved after 1st January 1842—Ten Sovereigns.

VI. For the best two Spayed Heifers, calved after 1st January 1843—Ten Sovereigns.

VII. For the best Ox or Spayed Heifer of any age—Ten Sovereigns.

VIII. For the best two Oxen, calved after 1st January 1842—Ten Sovereigns.

For the second best two ditto—Five Sovereigns.

IX. For the best two Oxen, calved after 1st January 1843—Ten Sovereigns.

For the second best two ditto—Five Sovereigns.

X. For the best two Heifers, calved after 1st January 1843—Ten Sovereigns.

For the second best two ditto—Seven Sovereigns.

XI. For the best single Heifer in calf—Five Sovereigns.

XII. For the best lot of Stirks, calved after 1st January 1844, not under one half of those bred on the farm, and not fewer than four in number—Ten Sovereigns.

For the second best ditto—Five Sovereigns.

NOTE.—In the above and following Classes, where the term "*Heifer*" is employed, it is understood to mean a breeding animal, unless otherwise specified.

SHORT-HORN BREED.

XIII. For the best Bull, calved between 1st January 1841 and 1st January 1843—Thirty Sovereigns.

For the second best ditto—Fifteen Sovereigns.

To the *Breeder* of the best Bull in this Class—The Honorary Silver Medal.

XIV. For the best Bull Stirk, calved after 1st January 1844—Fifteen Sovereigns.

For the second best ditto—Seven Sovereigns.

XV. For the best Breeding Cow, calved prior to 1st January 1843—Ten Sovereigns.

XVI. For the best Heifer, calved after 1st January 1843—Ten Sovereigns.

XVII. For the best two Heifers, calved after 1st January 1844—Ten Sovereigns.

AYRSHIRE BREED.

XVIII. For the best Bull, calved between 1st January 1840 and 1st January 1843—Fifteen Sovereigns.

For the second best ditto—Seven Sovereigns.

To the Breeder of the best Bull in this Class—The Honorary Silver Medal.

XIX. For the best Bull, calved after 1st January 1843—Five Sovereigns.

XX. For the best Milch Cow, calved prior to 1st January 1842—Ten Sovereigns.

For the second best ditto—Five Sovereigns.

XXI. For the best two Heifers, calved after 1st January 1843—Seven Sovereigns.

For the second best two ditto—Five Sovereigns.

WEST HIGHLAND BREED.

XXII. For the best two Oxen, calved after 1st January 1841—Ten Sovereigns.

XXIII. For the best two Heifers—Five Sovereigns.

POLLED BREEDS.

XXIV. For the best Ox of the Galloway, Aberdeen, or Angus Polled Breeds, calved after 1st January 1841—Ten Sovereigns.

ANY BREED.

XXV. For the best Ox of any breed, pure or cross, of any age, the particulars of the breed and age being specified—Ten Sovereigns.

§ II. HORSES.

Class I. For the best Stallion, from three to ten years old, for breeding Draught Horses—Forty Sovereigns.

For the second best ditto—Twenty Sovereigns.

II. For the best Stallion, from three to ten years old, for breeding Horses for Coach or Chariot—Twenty Sovereigns.

Note.—It is a condition attached to these three Premiums, that the Exhibitors shall be obliged to let out the Prize Horses for season 1846, to serve within such portion, and at such places in the District, comprehending the Counties of Dumfries, Kirkcudbright, and Wigton, as the Local Committee may fix; the number of Mares to be served not to exceed eighty, and the charge to be L.1, and 2s. 6d. for the Draught Stallion; and L.2, and 2s. 6d. for the Coaching Stallion.

III. For the best Mare for breeding Draught Horses, and which shall have been at least one year in the possession of the Competitor —Fifteen Sovereigns.

For the second best ditto—Ten Sovereigns.

Evidence of having had a foal to be produced.

IV. For the best three-year-old Draught Gelding—Five Sovereigns.

V. For the best two-year-old Draught Gelding—Five Sovereigns.

VI. For the best three-year-old Draught Filly—Five Sovereigns.

VII. For the best two-year-old Draught Filly—Five Sovereigns.

§ III. SHEEP.

LEICESTER BREED.

Class I.—For the best Tup, not exceeding five years old—Ten Sovereigns.

For the second best ditto—Five Sovereigns.

II. For the best Shearling Tup—Five Sovereigns.

III. For the best pen of three Ewes, not less than two years old —Five Sovereigns.

IV. For the best pen of three Gimmers—Five Sovereigns.

V. For the best pen of three fat Wedders, not exceeding 20 months old—Three Sovereigns.

CHEVIOT BREED.

VI. For the best two Tups, not exceeding 45 months old—Ten Sovereigns.

For the second best two ditto—Five Sovereigns.

VII. For the best three Shearling Tups, bred by the Exhibitor—Seven Sovereigns.

For the second best three ditto—Five Sovereigns.

VIII. For the best three Shearling Tups, the property of the Exhibitor, without reference to the Breeder—Five Sovereigns.

IX. For the best pen of ten Ewes, not exceeding six years old, selected from a regular breeding stock of not fewer than 200, rearing lambs during the season 1845 until the middle of July, and kept with the remainder of the stock until at least the Whitsunday preceding—Ten Sovereigns.

For the second best pen of ditto—Five Sovereigns.

X. For the best pen of ten Gimmers, selected from a regular breeding stock of not less than 200 Ewes, and kept with the breeding stock until the period of the Show—Five Sovereigns.

XI. For the best pen of five fat Wedders, not exceeding thirty-two months old—Five Sovereigns.

XII. For the best pen of five ditto, not exceeding twenty months old—Five Sovereigns.

BLACKFACED BREED.

XIII. For the best two Tups, not exceeding forty-five months old—Ten Sovereigns.

For the second best ditto—Five Sovereigns.

XIV. For the best pen of ten Ewes, not exceeding six years old, selected from a regular breeding stock of not fewer than 200, rearing lambs during the season 1845, until the middle of July, and kept with the remainder of the stock until at least the Whitsunday preceding—Ten Sovereigns.

For the second best pen of ditto—Five Sovereigns.

XV. For the best pen of ten Gimmers, selected from a regular breeding stock of not fewer than 200 Ewes, and kept with the breeding stock until the period of the Show—Five Sovereigns.

XVI. For the best pen of five fat Wedders, not exceeding fifty-six months old—Five Sovereigns.

SOUTHDOWN BREED.

XVII. For the best Tup—Ten Sovereigns.

XVIII. For the best pen of three Ewes—Five Sovereigns.

XIX. For the best three Wedders, showing most symmetry, fat, and weight—Five Sovereigns.

CROSSES.

XX. For the best pen of five fat Wedders, a cross between Leicester Tups and Cheviot Ewes, not exceeding twenty months old—Five Sovereigns.

For the second best ditto—Three Sovereigns.

XXI. For the best pen of five fat Wedders, a cross between Leicester Tups and Black-faced Ewes, not exceeding twenty months old—Five Sovereigns.

XXII. For the best pen of five fat Wedders, of any cross, under thirty-two months old—Five Sovereigns.

XXIII. For the best pen of ten Lambs, from Cheviot Ewes by Leicester Rams, or any long-wooled Ram, dropt subsequently to 1st March 1845, shown by the Breeder—Five Sovereigns.

§ IV. SWINE.

CLASS I. For the best Boar, large breed, not under twelve months, and not exceeding four years old—Five Sovereigns.

For the second best ditto—Two Sovereigns.

II. For the best Boar, small breed—Five Sovereigns.

For the second best ditto—Two Sovereigns.

III. For the best Breeding Sow, large breed, not under twelve months, and not exceeding four years old—Five Sovereigns.

For the second best ditto—Two Sovereigns.

IV. For the best breeding Sow, small breed—Four Sovereigns.

For the second best ditto—Two Sovereigns.

V. For the best two Pigs, not exceeding forty weeks old—Three Sovereigns.

§ V. POULTRY.

CLASS I. For the best couple of Turkeys, of any breed—Two Sovereigns.

For the second best ditto—One Sovereign.

II. For the best couple of Fowls, of the Dorking breed—One Sovereign.

For the second best ditto—Half a Sovereign.

III. For the best couple of any other Fowls, of pure breed—One Sovereign.

For the second best ditto—Half a Sovereign.

IV. For the best couple of Ducks, of any breed—One Sovereign.

For the second best ditto—Half a Sovereign.

V. For the best couple of Geese, of any breed—One Sovereign.

For the second best ditto—Half a Sovereign.

VI. For the best specimens of Poultry, of any other description, a sum of Three Sovereigns will be placed at the disposal of the Judges.

By the word "Couple" is meant a male and female of each sort.

§ VI. DAIRY PRODUCE.

1. CURING BUTTER.

Class I. To the owner of any Dairy who shall have made and cured the best quality of Butter for the Market, not being less than two cwt., during the season 1845—Five Sovereigns.

For the second best quality of ditto—Three Sovereigns.

2. MAKING CHEESE.

II. To the person who shall produce the best specimen of Sweet or Full Milk Cheese, made of any variety that he finds most profitable for the Market—Five Sovereigns.

For the second best ditto—Three Sovereigns.

The whole quantity of the variety of Cheese produced, made by each competitor during the season, must not be less than one cwt.; and a declaration, taken before a Justice of the Peace, must be lodged, that two or more cheeses produced are a fair average of the kind competing, made during the year by the competitor.

III. To the owner of any Dairy who shall have made for sale, during the season 1845, the best quality of Cheese from Skimmed Milk, not being less than one cwt.—Five Sovereigns.

For the second best quality of ditto—Three Sovereigns.

In the event of two or more competing lots being deemed equal in quality, the Premium will be awarded to the greater quantity.

§ VII. EXTRA, STOCK, ROOTS, SEEDS, &c.

For Extra Stock of any kind not shown for any of the above Premiums, and not exceeding, in one lot, five Cattle or ten Sheep, and for Roots, Seeds, &c., Premiums will be awarded and apportioned by the Committee and Judges, in Money, Plate, or Honorary Medals, to the amount of Fifty Sovereigns.

§ VIII. IMPLEMENTS AND MACHINES.

CLASS I. For the best collection of Agricultural Implements and Machines, of any description, manufactured by or under the superintendence of the Exhibitor, just proportion of parts, workmanship, utility, and price, being considered;—Ten Sovereigns.

II. For any new and useful Agricultural Implement or Machine that has been satisfactorily tested in actual work, not previously exhibited in competition—Five Sovereigns.

III. For any Design, Model, or Drawing of any new Machine or Implement applicable to any useful purpose connected with Agriculture, which may, in the opinion of the Judges, promise to be successful in accomplishing the object intended—A Gold or Silver Medal, as may be fixed by the Judges.

IV. For such useful improvement in the construction of the Subsoil Plough as may be best suited to accomplish the main object of subsoil ploughing, viz., moving, breaking, stirring, and effectually detaching the subsoil from its own substratum without bringing it to the surface—Seven Sovereigns.

V. For any useful improvement in the construction of the common two-horse Plough, which has for its object, the lifting and turning over the greatest quantity of the soil in a given time, with the least resistance to the draught, and which produces, at the same time, a fair and efficient surface for exposure, or for seed—Seven Sovereigns.

NOTE.—Here also it has been objected, that too much attention has been directed to the object of *fine*, rather than to really *useful* and effective ploughing.

VI. For any useful improvement in the construction of Barn Fanners—Five Sovereigns.

VII. For any useful improvement in Farm-Carts and Wheels—Five Sovereigns.

VIII. For any useful improvement on the Thrashing Machine, particularly on the Drum, having for its object the saving of horse-power and producing clean work—Six Sovereigns.

IX. For the most useful improvement in the construction of any of the Implements used in the cultivation of the Turnip and Potato crops—Five Sovereigns.

X. For the most useful improvement in any of the utensils or machines used in Dairy Husbandry—Five Sovereigns.

XI. To the Implement Maker, who shall have successfully introduced into Scotland, of his own manufacture, any Machine or Implement that is generally approved in the practice of Agriculture in England or elsewhere, or a Modification of the same, and which has hitherto been but little known or employed in Scotland—Five Sovereigns.

XII. For a Weighing Machine, adapted to general Farm Purposes, capable of weighing Stock or Produce, dead or alive, from the weight of a Sheep to that of a Loaded Cart, and which will indicate the addition of $\frac{1}{500}$th part of the mass to be weighed—Five Sovereigns.

XIII. For any improved Tile Pipe, or other invention for securing the run of water in drains, possessing the advantges of cheapness and durability, combined with efficiency—Ten Sovereigns.

XIV. Premiums in Money and in Medals will likewise be awarded for approved Patented Articles, and articles not coming within the range of any of the foregoing classes, to an amount not exceeding Twenty Sovereigns.

1. It will be allowable for the Judges to exercise their discretion in awarding the whole amount assigned to a class, either in one or more premiums, according to the claims of competitors; and, while awards are not to be made without positive merit in the articles exhibited, it is to be understood, that any sum which may be unappropriated in one class may, if considered proper, be applied to another class.
2. Implements and machines, designed to compete collectively for the premium in Class I., will be eligible to contend for the premiums in the other Classes to which they may distributively belong.
3. It is desirable that paint should not be used upon the wood or iron-work of the implements or machines exhibited, but they may be coated with transparent varnish. Exhibitors must be prepared, if required

by the Judges, to separate the parts of implements or machines, and must come provided with instruments for that purpose.

4. Competitors are required to furnish to the Secretary of the Society, on or before the 17th of September, descriptive Lists of the implements or machines intended for exhibition, prepared agreeably to the subjoined form, blank copies of which will be supplied on application to the Secretary of the Society, or to the Local Secretary.

FORM.

"I, of , hereby request you to enter the Implements particularized in the following Schedule, for competition at the General Show to be held at Dumfries, on the 7th day of October 1845, and following days.

IMPLEMENT.								REMARKS.
Name of implement.	Description or use.	Class for competition.	Maker's name and address.	Inventor's name and address.	If improved, in what particulars.	If for trial.	Price. £ s. d.	

§ IX. SWEEPSTAKES.

An opportunity will be afforded of subscribing for Sweepstakes. Particulars will be afterwards published; in the meantime communications by intending Subscribers may be addressed to the Local Secretary, Robert Threshie, Esq., Dumfries.

GENERAL REGULATIONS FOR THE SHOW.

1. The Stock must, at the date of the competition, be *bona fide* the property and in the possession of the party in whose name they are entered, and they must have been so at least from the 1st of May 1845.

2. The ages of the Stock will be calculated from the 1st of January of the year of birth. Where the precise age is known, it is to be stated.

3. Cattle fed on distillery or brewers' wash, or grains, are excluded from competition, as that food is not generally accessible. Stock which may have received oil-cake or grain

are not excluded ; but where cake or grain has been used, the quantities are to be stated in the certificate.

4. Cows in competition must have had a calf, or be in calf, and Ewes must have reared Lambs in the year 1845. If desired, evidence must be produced that Stallions and Bulls, if four years old or upwards, for which Premiums may be awarded, had produce in the preceding year. The Ewes must form part of regular breeding stocks.

5. *An animal having already gained a first* Premium at any of the Society's General Shows, is not to be shown again in competition in a class of the same denomination.

6. The stock to be shown, must be intimated by a certificate for each lot, according to the forms hereto annexed. It shall be competent to the Committee, if they see fit, to require the Exhibitor, or the person in charge of the Stock, to confirm the Certificates in the presence of a Magistrate on the day of competition. Printed Certificates, to be completed with the required particulars, and to be subscribed by the Exhibitor, may be had on application at the Society's Hall, Edinburgh, and at Robert Threshie, Esq., Secretary to the Local Committee.

The Secretary will be at Dumfries on the 16th and 17th of September, to answer enquiries, attend to details, and to receive certificates. In the meantime, certificates may be lodged with him at Edinburgh, or with the Local Secretary at Dumfries.

The certificates, duly completed, must be lodged with the Secretary of the Society, or transmitted, so as to reach him, at his office in Albyn Place, Edinburgh, or with the Local Secretary at Dumfries, at the latest by the 17th of September. The Certificates, when lodged, are not to be communicated, except by directions of the Committee. A Competitor may show more than one lot in any Class, but not more than three. It shall not be competent to enter a lot in one Class, and to withdraw it for competition in another, except by authority of the Committee. The same lot of Stock can be entered in one Class only.

7. Besides the Stock specified in the Classes of the above list, Cattle, Horses, Sheep, and Swine, possessed of merit, may be exhibited as Extra Stock, if duly intimated by a Certificate for each lot, in a form similar to what is prescribed for the Competing Classes, and lodged on or before the 17th of September. Stock which cannot be shown in any competing Class, may be exhibited as Extra Stock. If any lot of Fat Stock, for which a competing Class is open, is to be entered as Extra Stock, from an impression on the part of the Exhibitor that they are too young to compete in the Classes open to them, the Judges of Extra Stock are directed to notice them specially, provided they possess merit. Dairy Produce, Poultry, Implements, Seeds, Roots, Plants, &c., must also be intimated by lodging with the Secretary, on or before the 17th of September, notices of the Articles, as above mentioned.

8. A responsible person must attend at the Secretary's office in Dumfries, not later than the 3d of October, to give explanations if required, to receive instructions, and orders duly signed for the admission of the Stock to the Show-ground. The person so attending must be acquainted with the various particulars required to be certified.

9. A list of the Stock and articles entered will be made up by the Secretary on the 17th of September, and none will be allowed to compete which are not entered in that List.

10. All Stock and other articles entered, must be brought forward to the Competition, unless prevented by some unavoidable cause. If not so brought forward, the owner will, if a reason, satisfactory to the Chairman of the Committee, or to the Directors, is not assigned, be liable for all expenses caused by the entry, and any other course followed, which the Committee or Directors may consider proper. The Implements and Machines, Seeds, Roots, and Dairy Produce, must be brought to the Show-Ground by

nine o'clock in the morning of Tuesday the 7th October. The Stock must be brought to the Show-Ground between the hours of six and eight o'clock of the morning of Thursday the 8th October, to afford time for placing them. No Stock or other articles can come within the premises, without having an admission order. One servant only for each lot can be admitted, and he must continue in charge of the lot in the Show-Yard. Bulls must be secured by a ring or screw in the nose, with a chain or rope attached; otherwise, they will not be admitted into the Show-Yard. There are screws for temporary use, which Competitors will find it convenient to provide for Bulls that have not been usually ringed. The Competing Stock will be distinguished by *numbers*, so that the owner's name will not be known until the Premiums are decided.

11. The arrangements for the Show will be conducted by a Committee of the Society's Members. Skilful persons will be appointed to act as Judges, who will be divided into sections, to judge of the Classes with which they are best acquainted, in order to render the inspection as short as possible, and that the public may have early access to the Show-Ground. The Judges, in forming their opinion, will particularly attend to the instructions hereto annexed.

12. A Member of the Committee, or of the Deputation of Directors, will be appointed to attend each section of the Judges. A servant, provided with tickets, upon which shall be printed the Premium awarded, will be in attendance on the Member so appointed; and as soon as a section of the Judges shall determine which animal or animals are entitled to the Prizes in their respective Classes, the Member of the Committee or Deputation of Directors shall order the servant to affix the Prize Tickets on the animals, and the Member is to be responsible for the Tickets being affixed accordingly, that the public may have the earliest opportunity to examine the points of the Prize Cattle. None of the Tickets so placed shall be removed. If any Prize Ticket be removed and affixed to an animal which has not obtained a Premium, the parties so offending shall be proceeded against as the Committee or Directors may appoint. On Wednesday, the Stock shall be withdrawn, and the Show-Yard shut at four o'clock.

13. All the *Prize* Animals shall be brought to the Show-Ground by ten o'clock in the morning of the day immediately after the General Show (viz., on Thursday), under penalty of the owner forfeiting the Premiums. The Deputation of the Directors will then determine if Portraits of any of the Prize Animals shall be taken for the Society's Museum, and, in the event of any being selected, the owners are required to keep them in, or near the town, for such a reasonable time, as may be necessary to take the Portrait, under the penalty of forfeiting the Premium. The expense attending the detention, which will be limited to four days, to be paid to the owner by the Society, at a rate not exceeding 7s. 6d. per day. Those who may have Stock possessing particular merit, especially such animals as have been commended by the Judges, are invited to show them on this day, for the gratification of practical Breeders, when a favourable opportunity may be given to sell both Breeding and Fat Stock to advantage. The Premiums will be paid with the Society's General Premiums, on or after the 10th of February 1846.

14. No change can, under any circumstances, be made upon the General Regulations established by the Society for Agricultural Meetings and General Shows of Live Stock, so far as Competitors are interested, unless regularly submitted and approved at a Meeting of the Directors in Edinburgh, and duly intimated to Competitors.

His Grace the DUKE of MONTROSE, President, and the Vice-Presidents of the Society; the Lord-Lieutenants, Vice-Lieutenants, and Conveners of the Counties of Dumfries, Kirkcudbright, and Wigton, with an adequate number of the Members of the Society, to be named at the Meetings on the 30th of April by these Counties, together with the Secretaries of the Local Agricultural Associations in the said Counties, have

been appointed a Committee for regulating all details connected with the Agricultural Meeting and General Show of Live Stock at Dumfries. His Grace the Duke of Buccleuch and Queensberry, Chairman ; James Macalpine Leny, Esq. of Dalswinton, Convener, and Robert Threshie, Esq., Secretary of the Committee.

FORM OF CERTIFICATE FOR FAT OXEN.

I, near the post town of in the county of do certify, That my Ox (or Oxen, as the case may be) of the breed, to be shown at the General Show of Live Stock at Dumfries, for the premium in Class was bred by Mr. of , and purchased by me from on or about ; he was calved , and will, at the date of the Show, be years and months old, and has been fed by me on . The quantity of cake or corn he has consumed has been . He has not at any time been fed on distillery or brewers' wash or grains. He will have to travel on foot (or by steam, or other conveyance, as the case may be) miles, or thereby, from the place of feeding to the Show at Dumfries. He was first put up to fatten on or about the of day Witness my hand this day of 1845.

(*Signature of the Exhibitor.*)

Any observations as to the animal's appearance and state of flesh when put up to feed, or other particulars which the Exhibitor may think material, and more especially the pedigree, may be subjoined to the above certificate.

FORM OF CERTIFICATE FOR CATTLE—LEAN OR BREEDING STOCK.

I, , of , near , in the county of , do certify, That my , of the breed, to be shown at the General Show of Live Stock at Dumfries, for the Premium in Class , bred by , and purchased by me from on or about , and calved , will, at the date of the Show, be years and months old, and since been in my possession, food been will have to travel on foot miles or thereby, to the Show at Dumfries. Witness my hand this day of 1845.

(*Signature of the Exhibitor.*)

N.B.—Any observations with reference to other particulars, which the Exhibitor may think material, may be subjoined to the above certificate. The pedigree, when known, must also be stated.

FORM OF CERTIFICATE FOR HORSES, SHEEP, OR SWINE.

I, of , near , in the county of , do certify, That my , of the breed, to be shown at the General Show of Live Stock at Dumfries, for the Premium in Class , bred by , and purchased by me from , foaled (lambed, or pigged, as the case may be) , will, at the date of the Show, be years and months old, and since been in my possession, food been ;—will have to travel on foot miles or thereby, to the Show at Dumfries. Witness my hand this day of 1845.

(*Signature of the Exhibitor.*)

N.B.—Any observations with reference to other particulars, which the Exhibitor may think material, may be subjoined to the above certificate. The Pedigree, when known, must also be stated.

INSTRUCTIONS TO THE JUDGES.

1. The Judges will assemble on the morning of the Show, at the time and place to be appointed by the Committee. When it is intimated that the Stock is ready to be examined, the Judges will proceed to the respective Classes, which have been assigned to them. Without inquiry as to the names of parties or places, they will decide upon the merits of the animals, and their awards shall make reference merely to the *numbers* which distinguish the animals. The Member of the Committee or Deputation of Directors, who attends each section of the Judges will receive from the Secretary, blank Reports to be completed by him, under their instructions, with the awards of the Premiums. In this Report, the *numbers* referable to the lots recommended must be distinctly written in words, and not in figures. The Judges will report not only those animals entitled to Premiums, but also the next in merit in each Class, to meet the contingency of any challenge which may be made against the Prize animals. They will also point out any animals, portraits of which they may consider should be taken for the Society's Museum. They will sign and deliver their Report, and they are not afterwards to propose any change. In the event of a difference of opinion, the majority of the Judges who have examined the Lot shall be conclusive. When the Report is delivered to the Committee, the duty of the Judges shall cease, and the Committee shall award the Premiums.

2. The Judges, in examining the Stock, will proceed on the understanding, that the Committee are satisfied with the regularity of the Certificates; but if any of the Stock does not, in their opinion, come within the Regulations, or is of such a character as ought not to be exhibited, they will state their opinion to the Committee, that such course may be adopted as shall appear necessary. Should the Judges desire to have the information communicated in the Certificates, as to the mode of feeding or other particulars, they will apply for the same to the Committee through the Secretary.

3. The Judges will have regard to the symmetry, early maturity, purity, size, and general qualities characteristic of the breeds of which they judge. They will make due allowance for age, feeding, and other circumstances, bearing on the character and condition of the animals. They will not give encouragement for over-fed animals. They will not award Premiums for Bulls, Cows, or Heifers, which shall appear to have been fattened for the butcher, the object being to have superior animals of these descriptions for breeding. In no case shall a Premium be adjudged, unless the Judges shall deem the animals to have sufficient merit, more especially if only one lot is presented for any of the Premiums.

CLASS X.

THE GENERAL SHOW OF LIVE STOCK

AND

AGRICULTURAL MEETING AT INVERNESS IN 1846.

The General Show of Live Stock, and Exhibition of Implements, Roots, Seeds, &c., will in 1846 take place at INVERNESS, when liberal Premiums will be awarded by the Society, aided by dona-

tions from the Noblemen, Gentlemen, and Local Agricultural Associations, of the Counties more immediately interested, and from the Town of Inverness.

The Premiums will, in communication with a Committee of Members of the Society in the District, and of Members of the Local Associations, be forthwith fixed, and published for the information of intending Competitors.

THE VETERINARY COLLEGE.

This Establishment is conducted under the superintendence of Professor Dick, Veterinary Surgeon, the Lecturer appointed by the Society. Students receive instruction in the anatomy, physiology, and pathology of the Horse, Neat Cattle, the Sheep, the Pig, and the Dog, including also, stable management and the forge; and in order to the arrangement of the several departments of study at hours convenient for the Students, the professor has the assistance of Veterinary Surgeons, who, under his superintendence, take charge of the Anatomical Demonstrations, Materia Medica, and Pharmacy. Instructions are also given in Chemistry in connection with the Course. The Students are sent to the College by Local Agricultural Associations, or attend on their own account. Those Students who attend two courses, and are afterwards found qualified at the Annual Examination by the Committee of Medical Examinators, receive Diplomas. Graduates of the College are eligible for Veterinary Surgeons in the Army and East India Company's Service.

Professor Dick occasionally delivers a popular course of Lectures to a class of Gentlemen. It may be also observed, that several of the principal Lecturers in different branches of Medical Science, have for some years given free admission to their classes to those Veterinary Students who intend to practice.

The Lectures and Demonstrations for the Session 1845–46 will be commenced in November next, at the Lecture-room in Clyde Street, Edinburgh.

By order of the Directors.

CHARLES GORDON, *Secretary.*

LIST OF MEMBERS

OF

THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND,

AT 20TH FEBRUARY 1845.

ALPHABETICALLY ARRANGED, AND DISTINGUISHING THE YEAR OF ADMISSION.

PRESIDENT,

HIS GRACE JAMES DUKE OF MONTROSE.

The Members marked thus *, have been Presidents; and thus † Vice-Presidents.

New Members are admitted at the General Meetings of the Society by Ballot. There are two such Meetings Annually, viz. the Anniversary Meeting, on the second Tuesday of January, and the Summer General Meeting, on such day in June or July as may be fixed by the Directors, and intimated in terms of the Charter. Members pay an Annual Contribution of £1, 3s. 6d.; or, in their option, and in full of all future claims, a Life Subscription of Twelve Guineas.

LIST OF MEMBERS.

	Admitted
ARGYLL, His Grace John Douglas Edward Henry, Duke of	1798
†AILSA, The Most Noble Archibald, Marquis of, K.T.	1793
ABERCORN, The Most Noble James, Marquis of	1833
†AIRLIE, The Right Hon. David, Earl of	1819
ABERDEEN, The Right Hon. George, Earl of, K.T.	1805
ABOYNE, The Right Hon. Charles, Earl of	1819
†ARBUTHNOTT, The Right Hon. John, Viscount	1803
ABERCROMBY, The Right Hon. George Ralph, Lord	1825
ABINGER, The Right Hon. R. C., Lord	1841
ABERCROMBY, Lady, of Birkenbog and Netherlaw	1840
ARBUTHNOTT, Lieut.-General the Hon. Hugh, M.P. for Kincardineshire	1811
ARBUTHNOTT, The Hon. John	1833
ABERCROMBY, Sir Robert, of Birkenbog and Forglen, Bart.	1816
AGNEW, Sir Andrew, of Lochnaw, Bart.	1829
ANTROBUS, Sir Edmund, of Rutherford, Bart.	1829
ANSTRUTHER, Sir Windham Carmichael of Anstruther and Carmichael, Bart.	1842
ANSTRUTHER, Sir Ralph Abercrombie, of Balcaskie and Watten, Bart.	1832
ADAM, Vice-Admiral Sir Charles, of Blair-Adam, K.C.B.	1829
ALEXANDER, Sir James Edward, late 16th Lancers	1831
ANGRAND, The Chevalier, late Consul of France at Edinburgh	1839
Abercromby, Alexander, 1 Albany Place, Glasgow	1844
Abercromby, Arthur, of Glassaugh	1832
Adair, John, of Genoch	1829
Adam, James, W.S.	1807
Adam, James, Denovan Field	1839
Adam, James, S.S.C.	1842
Adam John, of Scobbach, Turriff	1839
Adam William, of Ranna, Advocate, Aberdeen	1839
Addie, Robert, of Whiterig	1844
Adinston, Thomas, of Carcant	1842
Agnew, Robert Vans, of Sheuchan and Barnbarroch	1843
Ainslie, John, of Maxpofle	1831
Ainslie, P. B., St. Colme House	1826

	Admitted
Aitchison, Francis, of Borland	1831
Aitchison, James, of Alderston	1822
Aitchison William, of Drummore	1809
Aitchison, William, at Linhope	1835
Aitken, Robert, 35 St. Vincent Place, Glasgow	1844
Aitken, James, Gartcous	1834
Aiton, Rev. Dr. John, Minister of Dolphinton	1828
Alcock, Robert, Advocate, Aberdeen	1833
Alexander, Boyd, third son of the late Claud Alexander, of Ballamyle	1823
Alexander, James, of Balmule	1842
Alexander, W. Maxwell, of Southbar	1823
Alison, Alexander, 110 St Vincent Street, Glasgow	1844
Alison, Archibald, Advocate, Sheriff of Lanarkshire	1838
Alison, Robert, late of Customs, Dundee	1843
Allan, Alexander, Advocate	1833
Allan, John, Old Liston, Kirkliston	1840
Allan, William, of Glen and Hillside	1830
Allardyce, Robert Barclay, of Ury	1810
Allardes, James, late of Boynsmill	1830
Allen, James, Merchant, Grangemouth	1815
Allen, John Lee, of Erroll	1821
Allen, John James, younger of Erroll, Captain R.N.	1839
Alston, George, of Muirburn, Merchant, Glasgow	1838
Alston, James W., of Stockbriggs	1844
Alston, John, Manufacturer, Glasgow	1827
Alston, Robert Douglas, Merchant, Glasgow	1836
Anderson, Adam, LL.D., St. Andrews	1829
Anderson, Adam, Advocate, H. M. Solicitor-General for Scotland	1834
Anderson, Alexander, Advocate, Aberdeen	1838
Anderson, A. D., M.D., 159 St. Vincent Street, Glasgow	1844
Anderson, Major Alexander, of Montrave, H.E.I.C.S.	1833
Anderson, David, of Moredun	1825
Anderson, David, of St. Germains	1829
Anderson, David, Westhaven, Dundee	1843
Anderson, Francis, W.S.	1841
Anderson, George, Solicitor, Inverness	1839
Anderson, George, Hill Street, Glasgow	1844
Anderson, James, Newton of Ballunie	1838
Anderson, James A., Banker, Glasgow	1838
Anderson, James, of Gorthleck	1839
Anderson, James, Glasgow	1843
Anderson, John, Merchant, London	1838
Anderson, John, Merchant, Glasgow	1838
Anderson, John, of Whitburgh, Ford	1840
Anderson, John, Factor for Lord Lovat, Strichen	1840

	Admitted
Anderson, Michael, Edinburgh	1831
Anderson, Robert, of Candycraig	1842
Anderson, Robert, Halls, Dunbar	1842
Anderson, Thomas, of Caigance, Advocate	1832
Anderson, Dr. William S., H.E.I.C.S., residing at Greenock	1839
Anderson, William, Town-Clerk of Leith	1842
Anderson, William James, of Techmuiry	1840
Andrews, William, No. 9 Bridge Street, London	1841
Angus, Ritchie, 121 Clarence Place, Glasgow	1844
Anstruther, James, of Tillicoultry	1827
Arbuthnot, George Clerk, of Mavisbank	1844
Arbuthnot, James Carnegie, of Balnamoon	1813
Arbuthnot, Thomas, of Meethill	1829
Armstrong, Charles, of Cherry Valley, County of Antrim, Ireland	1836
Arkley, Patrick, of Duninald, Advocate	1840
Arnott, G. A. Walker, of Arlary	1837
Arnott, James, of Leithfield, W.S.	1835
Arundell, G. Hunter, of Barjarg	1839
Ashby, Shukbrugh, 37, Northumberland St., Edinburgh	1843
Askew, Henry William, of Minard	1845
Aytoun, Roger, of Inchdairnie	1844
Aytoun, Roger, Banker, Greenock	1826
Aytoun, William Edmonstoune, Advocate	1838

B

Buckingham and Chandos, His Grace Richard Plantagenet, Duke of, Honorary Member	1837
*Buccleuch and Queensberry, His Grace Walter Francis, Duke of, K.G.	1828
Buccleuch and Queensberry, Her Grace, Charlotte, Duchess of	1835
†Bute, The Most Noble John, Marquis of	1815
†Breadalbane, The Most Noble John, Marquis of	1819
Breadalbane, The Right Hon. Elizabeth, Marchioness of	1838
Buchan, The Right Hon. Henry David, Earl of	1811
Blantyre, Right Hon. Charles, Lord	1843
Belhaven and Stenton, The Right Hon. Robert, Lord	1816
Berriedale, The Right Hon. James, Lord	1845
Bexley, The Right Hon. Nicholas, Lord, Hon. Mem.	1801
Boyle, Right Hon. David, Lord Justice-General	1804
Burnett, Sir Thomas, of Leys, Bart.	1824
Bruce, Sir Michael, of Scotstown and Stenhouse, Bart.	1825
Baird, Sir James Gardner of Saughtonhall, Bart., 10th Royal Hussars	1843
Blair, Sir David Hunter, of Brownhill, Bart.	1801
Baird, Lady, of Ferntower	1809

	Admitted
Baird, Sir David, of Newbyth, Bart.	1838
Baillie, Sir William, of Polkemmet, Bart.	1818
Bannerman, Sir Charles, of Crimmonmogate, Bart.	1834
Bethune, Sir Henry, of Kilconquhar, Bart.	1839
Boswell, Sir James, of Auchinleck, Bart.	1834
Brisbane, Lieutenant-General, Sir Thomas M., of Brisbane and Makerston, Bart., G.C.B.	1801
Brown, Sir Samuel, of Netherbyres, Capt. R.N.	1829
Ballingall, Sir George, M.D., Prof. of Military Surgery in the University of Edinburgh	1821
Barns, Major-General Sir James Stevenson, of Kirkhill	1803
Baikie, James, of Tankerness	1818
Baillie, Charles, Advocate	1831
Baillie, James Evan, of Glenelg and Kingussie	1839
Baillie, Ewen, of Dochfour	1824
Baillie, A. D. Cochrane Wishart, of Lamington, M.P.	1842
Baillie, George, of Jerviswood	1841
Baillie, Henry James, younger of Redcastle, M.P.	1839
Baillie, Colonel Hugh Duncan, of Redcastle, M.P.	1839
Baillie, John Frederick, of Leys	1839
Baillie, Robert Granberry, of Coulterallers	1819
Bain, John, one of the Magistrates of Glasgow	1838
Bain, John, Banker, St. Andrews	1842
Baird, Alexander, of Faskine and Palace Craig	1845
Baird, Charles J., Manager of Shotts Iron-works	1844
Baird, Douglas, Gartsherrie	1838
Baird, George, Gartsherrie	1838
Baird, James, Gartsherrie	1838
Baird, John, of Shotts Iron-works	1815
Baird, John, Highcross	1838
Baird, Robert, Gartsherrie	1838
Baird, William, of Gartsherrie Iron-works	1844
Baird, William, Grain Merchant, Glasgow	1844
Bald, Robert, Civil-Engineer, Edinburgh	1828
Balfour, David, younger of Trenabie	1843
Balfour, Francis, of Fernie	1824
Balfour, James, of Pilrig, W.S.	1824
Balfour, James, Pilmuir, Leven	1842
Balfour, John, of Balbirnie	1839
Balfour, Dr. John Hutton, Professor of Botany, Glasgow	1839
Balfour, Captain William, of Trenabie, R.N.	1819
Balfour, William, junior, Kirkwall	1844
Balfour, William, Merchant, Glasgow	1820
Ballendene, James, of Pitgober	1834
Ballantyne, James, of Castlehill	1822
Ballantyne, James of Holylee	1832
Bannerman, Alexander, M.P. for the City of Aberdeen	1835

	Admitted
Bannerman, Patrick, Advocate, Aberdeen	1825
Barclay, Alexander, of Gottenburgh	1839
Barclay, George Robertson, of Keavil	1834
Barker, Thomas, of Sydney, Australia	1839
Barlas, Robert, Gilmore Place, Edinburgh	1844
Bartholomew, John, Merchant, Glasgow	1838
Bartholomew, Robert, Merchant, Glasgow	1838
Bartholomew, Thomas, Merchant, Glasgow	1838
Bartlemore, Alexander, of Seaside	1825
Bauchope, Robert, Factor for his Grace the Duke of Hamilton, at Kinneil	1831
Baxter, David, Craigie House, Dundee	1843
Baxter, John G., Ellengowan, Dundee	1843
Baxter, William G., Ellengowan, Dundee	1843
Bayley, Isaac, Regent Terrace	1828
Bayne, Dr. James, Physician, Inverness	1813
Beatson, H. Dundas, Captain, Swift Revenue Cutter	1809
Begbie, Alexander, late of Pinnaclehill, Leamington	1832
Beith, John, Banker, Campbeltown	1836
Belches, Alexander Hepburn Murray, of Invermay	1824
Belches, Lieut.-Colonel John H. Murray, Invermay	1825
Belford, Andrew, of Glenfintaig, Solicitor, Inverness	1839
Bell, Allan, of Hilloton, Castle-Douglas	1839
Bell, Archibald, Advocate, Sheriff of Ayrshire	1833
Bell, Carlyle, W.S. one of the Principal Clerks of the City of Edinburgh	1824
Bell, George Graham, of Castle O'er, Advocate	1835
Bell, George, Merchant, Leith	1826
Bell, George, of Menslaws	1842
Bell, John, of Enterkine	1839
Bell, John Beatson, of Glenfarg, W.S.	1841
Bell, Robert, Advocate, Sheriff of Berwickshire	1823
Bell, Robert, M.D., Dundee	1843
Bell, William, W.S.	1813
Bell, William, of Gribtae	1840
Bennie, Rev. Archibald, D.D., Edinburgh	1842
Berry, William, of Tayfield	1800
Bertram, John Primrose, W.S.	1845
Bertram, Thomas Hardy, Engineer of the Great Western Railway, Reading, Berks	1845
Bertram, William, Cranshaws	1826
Berwick, Alexander, of Nortonhall	1839
Bethune, John Elliot Drinkwater, of Balfour	1841
Beveridge, Thomas, Depute-Clerk of Session	1816
Beveridge, Thomas Knox, W.S.	1833
Bigg, Thomas, 15, Crawford Street, London	1842
Bishop, James, Restonhill	1839

	Admitted
Black, James, Merchant, 17, Blythswood Square, Glasgow	1839
Black, James, Merchant, 12, Montague Place, Glasgow	1839
Black, James, Merchant, Royal Bank Place, Glasgow	1838
Black, James Spens, Merchant, 17, Blythswood Square, Glasgow	1839
Black, Robert, 3, Royal Crescent, Glasgow	1844
Black, William, St. Mary's Buildings, Glasgow	1844
Blackburn, Peter, of Killearn	1842
Blackwood, Alexander, Bookseller, Edinburgh	1835
Blackwood, John, Bookseller, London	1842
Blackwood, Robert, Bookseller, Edinburgh	1835
Blaikie, Thomas, Lord Provost of Aberdeen	1840
Blaikie, John, of Craigiebuckler, Advocate, Aberdeen	1837
Blair, David Anderson, of Inchyra	1819
Blair, Colonel Thomas Hunter, C.B. of Dunskey	1835
Blair, Captain William Fordyce, of Blair	1844
Blair, William, of Avonton	1817
Blandow, Michel Von, St. Petersburgh, Honorary Member	1836
Blane, Robert, of Grougar, 2d Life Guards	1836
Blood, Bindon, of Cranaker, Ireland	1833
Bogle, James, junior, Merchant, Glasgow	1844
Booth, James Godfrey, Seed Merchant, Hamburgh	1842
Bonar, Andrew, Banker, Edinburgh	1824
Bonar, James, of Kimmerghame	1835
Bonar, William, Banker, Edinburgh	1828
Bonar, William Graham, of Greigston	1835
Bontine, R. Cunningham, of Ardoch	1823
Boag, James, Merchant, Edinburgh	1842
Boog, William, Sweethope, Kelso	1841
Borthwick, John, of Crookston	1812
Borthwick, Thomas Chalmers, of Hopesrig	1838
Borthwick, Lieut.-Colonel William, Madras Establishment	1843
Boswall, Captain John Donaldson, of Wardie, R.N.	1814
Boswell, John Irvine, of Kingcaussie and Balmuto	1823
Boswell, John Douglas, of Garallan	1836
Boulderson, Shadwell M., Conon-House	1840
Bousie, Andrew, Writer, St. Andrews	1841
Bowie, John, W.S.	1815
Boyd, Adam Brack, of Cherrytrees	1841
Boyd, John, of Broadmeadows	1804
Boyle, Patrick, younger of Shewalton	1835
Brander, Lieut.-Colonel James, of Pitgaveny	1827
Brander, James, Banker, Golspie	1830
Brebner, James, Advocate, Aberdeen	1834
Bremner, Charles, W.S.	1800
Bremner, James, Civil-Engineer, Pulteneytown	1839
Briggs, Lieut.-Col. John Falconer, of Strathairly	1828

	Admitted
Brock, Henry, Banker, Glasgow	1838
Brodie, James Campbell, of Lethen	1831
Brodie, John Scoughall	1822
Brodie, John, Abbey Mains	1840
Brodie, John Clerk, W.S.	1840
Brodie, Peter, Clairilaw	1834
Brodie, William, of Brodie	1821
Broom, Alexander, Architect and Builder, Glasgow	1838
Brotherston, James, Banker, Newton, Wales	1838
Brown, Alexander, Merchant, Aberdeen	1825
Brown, Alexander, Secretary Morayshire Farmers' Club	1832
Brown, Alexander, Merchant, Glasgow	1838
Brown, Alexander, 6, Rutland Square, Edinburgh	1844
Brown, Andrew, of Auchintorlie,	1844
Brown, Andrew, Dundee	1844
Brown, Major David, of Park	1834
Brown, David Wardlaw, Blanerne House, Berwickshire	1841
Brown, George, at Wattin Mains	1839
Brown, George, Halls, Dunbar	1842
Brown, Hugh, of Broadstone, Ayrshire	1823
Brown, Major J. D., Drylawhill	1821
Brown, James, Accountant, Edinburgh	1816
Brown, James, Merchant, Dundee	1843
Brown, James, Eskmill	1845
Brown, J. S., 17, George Square, Edinburgh	1841
Brown, Hugh H. of Newhall	1843
Brown, James Thomas, younger of Auchlochan	1837
Brown, John, of Coultermains	1807
Brown, Matthew, Port-Glasgow	1832
Brown, Peter, Linkwood	1821
Brown, Robert, of Drumbrexhill	1802
Brown, Thomas, of Lanfine and Waterhaughs	1832
Brown, William, Merchant, Glasgow	1828
Brown, William, Banker, Maybole	1835
Brown, William, Merchant, Dundee	1843
Brown, William Henry, of Ashley	1833
Browne, James, of Bindarroch, Merchant, Glasgow	1838
Bruce, C. L. Cumming, of Roseisle and Kinnaird, M.P.	1817
Bruce, James, Middleton, Mintlaw	1837
Bruce, John, younger of Sumburgh	1829
Bruce, John, 22 York Place, Edinburgh	1842
Bruce, Oneziphorous Tyndall, of Falkland	1829
Bruce, Robert, of Symbister, Zetland	1807
Bruce, Robert, of Kennet	1819
Bruce, Robert, Advocate, Sheriff of Argyllshire	1828
Bruce, Thomas, of Arnot	1820

	Admitted
Bruce, Thomas, of Langlee, W. S.	1828
Bruce, William, of Bigton, Zetland	1838
Bruce, William, Glasgow	1844
Bryce, Rev. James, D.D., formerly Minister of the Scots Church, Calcutta	1813
Buchan, George, of Kelloe	1826
Buchan, William, Farmer and Distiller, Ratho Hall	1839
Buchanan, Alexander, of Arnprior	1819
Buchanan, Alexander, Farmer, West Whitehill, Garnkirk	1843
Buchanan, Andrew, of Auchintorlie	1838
Buchanan, Andrew, of Mount Vernon	1827
Buchanan, Charles Snodgrass, of Cunninghamhead	1838
Buchanan, George, of Arden	1838
Buchanan, George, younger of Downhill, Merchant, Glasgow	1838
Buchanan, James, Darnaway Street, Edinburgh	1820
Buchanan, James, of Catrine, Ayrshire	1838
Buchanan, John, of Carbeth	1838
Buchanan, John, Coachbuilder, Glasgow	1838
Buchanan, John, junior, Merchant, Glasgow	1838
Buchanan, John, Wine-Merchant, Glasgow	1827
Buchanan, John, at Finnich	1831
Buchanan, John, of Glenlora	1844
Buchanan, Robert, Glasgow	1811
Buchanan, Rev. Thomas, Minister, Methven	1840
Buchanan, Walter, of Shandon	1842
Buchanan, Walter, M.D., Greenock	1844
Buchanan, William, Merchant, Glasgow	1828
Buist, James, Kirkton Barns	1842
Burn, Henry J., W.S.	1843
Burn, James, W.S.	1825
Burn, William, Architect, Edinburgh	1824
Burnett, Alexander, at Crathes	1834
Burnett, Alexander, Tacksman of Kinchyle, Factor for Lady Saltoun	1839
Burnett, Gregory, Ardross	1840
Burnett, James, Horn, W.S.	1834
Burnett, John, of Kemnay	1809
Burnett, John, Writer, Glasgow	1844
Burnett, John Joseph, of Gadgirth	1836
Burnett, Newell, Advocate, Aberdeen	1834
Burnett, Thomas, Advocate, Aberdeen	1825
Burnley, W. F., Merchant, Glasgow	1838
Burt, Dr. John, Edinburgh	1831
Butter, Archibald, of Faskally	1825
Buttery, A. W., Monkland Iron Works	1844
Byres, Major-General Patrick, of Tonley	1843

C

	Admitted
Cambridge, His Royal Highness Prince Adolphus Frederick, Duke of, K.G.	1838
Caithness, The Right Hon. Alexander, Earl of	1814
†Cathcart, Lieut.-Gen. Right Hon. Charles, Earl of, K.C.B.	1809
†Cawdor, The Right Hon. John Frederick, Earl of	1831
Campbell, The Right Honourable John, Lord, London	1834
Cuninghame, The Hon. Lord	1833
Cathcart, Colonel, The Hon. Frederick Macadam, of Craigengillan	1830
Campbell, Sir John, of Ardnamurchan, Bart.	1829
Campbell, Sir James, of Aberuchill and Kilbride, Bart.	1838
Carmichael, Sir Thomas Gibson, of Castlecraig, Bart.	1806
Carnegie, Sir James, of Southesk, Bart.	1843
Clerk, Sir George, of Penicuik, Bart. M.P.	1812
Campbell, Sir Archibald, of Succoth, Bart.	1813
Campbell, Sir Hugh Purves Hume, of Marchmont, Bart. M.P. for Berwickshire	1834
Cathcart, Sir John Andrew, of Carleton, Bart.	1834
Cameron, Sir Duncan, of Fassfern, Bart.	1800
Campbell, Sir Donald, of Dunstaffnage, Bart.	1823
Campbell, Lieut.-Colonel Sir John, Bart., 38th Regiment	1844
Campbell, Lieut.-General Sir Colin, K.C.B.	1816
Campbell, Sir James, late Lord Provost of Glasgow	1838
Cochrane, Admiral Sir Thomas, Royal Navy, C.B.	1817
Colebrooke, Sir Thomas Edward, of Crawford, M.P.	1838
Chalmers, Colonel Sir William, of Glenericht	1822
Cadell, Alexander Tod, Madras Army	1844
Cadell, Lieut.-Colonel George, late H.E.I.C.S.	1842
Cadell, Hugh Francis, of Cockenzie	1844
Calder, Robert, Farmer at Sibster, Caithness	1839
Caldwell, Frederick, of Missinish	1841
Callender, Henry, Accountant, Edinburgh	1843
Callender, James Henry, of Craigforth	1830
Callender, William Burn, of Prestonhall	1818
Cameron, Alexander, Surinam	1819
Cameron, Allan, Calligarry	1803
Cameron, Donald, of Lochiel	1834
Cameron, Donald Charles, of Barcaldine	1825
Cameron, Hugh Innes, Provost of Dingwall	1835
Cameron, Colonel Hugh John, of Letterfinlay	1840
Cameron, James, Ardintrive, Island of Kerrera, Oban	1844
Cameron John, Corrychoiley	1826
Campbell, Lieutenant-Colonel Alexander, of Possil	1810
Campbell, Alexander, of Auchindarroch	1837
Campbell, Captain Alexander, of Brackley	1806
Campbell, Alexander, London	1804

	Admitted
Campbell, Alexander, of Monzie	1833
Campbell, Alexander, of Bedlay	1833
Campbell, Alexander, of Barnhill	1833
Campbell, Alexander, Great Stuart Street, Edinburgh	1835
Campbell, Archibald, younger of Jura	1834
Campbell, Archibald, of Catrinebank	1810
Campbell, Archibald James, of Kilpatrick	1824
Campbell, Archibald, of Glendaruel	1826
Campbell, Archibald, Camusearnie Cottage, Factor on the estate of Menzies	1832
Campbell, Archibald, Lochhead	1838
Campbell, Archibald of Lochnell	1840
Campbell, Archibald, of Blythswood	1840
Campbell, Archibald, M.D., younger of Lerags	1845
Campbell, Archibald Islay, younger of Succoth	1844
Campbell, Arthur, of Condorrat, W.S.	1816
Campbell, Charles, of Combie	1808
Campbell, Charles, Banker, Glasgow	1838
Campbell, Charles William, of Borland, Killin	1840
Campbell, Colin, of Jura	1810
Campbell, Colin, of Colgrain	1829
Campbell, Colin G., younger of Stonefield	1838
Campbell, David, Mount-Hamilton	1835
Campbell, Captain Donald, of Barbreck	1840
Campbell, Donald, younger of Sonachan	1840
Campbell, Lieut.-Colonel Dugald, Royal Artillery	1818
Campbell, Duncan, of Ross, Advocate	1823
Campbell, Farquhar, Ormsary	1839
Campbell, Francis Garden, of Troup and Glenlyon	1840
Campbell, George, younger of Succoth	1833
Campbell, George James, of Treesbanks	1835
Campbell, Henry Fletcher, of Boquhan	1823
Campbell, Humphrey Walter, Sheriff-substitute of Dunbartonshire	1838
Campbell, James Archibald, of Inverawe	1833
Campbell, James, of Craigie	1824
Campbell, James, of Moore Park, Merchant, Glasgow	1838
Campbell, James, Succoth, Wine-Merchant, Edinburgh	1839
Campbell, John, late of Craignure	1803
Campbell, John, of Stonefield	1808
Campbell, John, of Glen Saddel	1817
Campbell, John, of Blairhall	1819
Campbell, Captain John, Royal Scots Greys	1844
Campbell, John F., younger of Islay	1844
Campbell, John, of Southhall	1821
Campbell, John, of Otter	1827
Campbell, John, of Strachur	1829

	Admitted
Campbell, John, of Kilberry	1842
Campbell, Colonel John, of Blackhall	1803
Campbell, John Deans, of Curreath and Loeg	1835
Campbell, John Archibald, W.S.	1813
Campbell, John, of Carbrook, W.S.	1793
Campbell, Kenneth, of Ardow	1843
Campbell, Lorne, Roseneath	1824
Campbell, Lachlan M'Neill, of Kintarbert	1833
Campbell, Mungo Nutter, of Ballymore	1832
Campbell, Mungo, Hallyards	1824
Campbell, Mungo, of Hay Lodge	1837
Campbell, Ord Graham, Edinburgh	1838
Campbell, Richard, of Auchinbreck	1833
Campbell, Richard D., Jura	1836
Campbell, Robert, Roseneath	1803
Campbell, Robert, of Sonachan	1802
Campbell, Robert, of Auchmannoch	1816
Campbell, Major Robert Nutter, of Ormidale	1844
Campbell, Robert Nutter, Kailzie	1798
Campbell, Rose, late of Spain	1809
Campbell, Thomas, Merchant, Glasgow	1837
Campbell, Walter Frederick, of Islay	1817
Campbell, Captain Walter, Skipness	1836
Campbell, William, W.S.	1805
Campbell, William, of Tillichewan Castle	1838
Campbell, William, of Ormsary	1839
Campbell, William, of Ederline	1843
Campbell, William B. Stewart, of Clochfoldich, W.S.	1839
Campbell, William L., of Glenfalloch	1833
Cannon, James, residing at Shiel	1813
Carfrae, Major-General John, of Bowerhouse	1842
Carlisle, William, of Houstonfield	1835
Carmichael, James, Raploch Farm	1838
Carmichael, Michael Thomson, of Eastend	1825
Carnaby Thomas, Gen. Clerk of Lieutenancy, Forfarshire	1831
Carnegie, John of Redhall	1836
Carnegie, William Fullerton Lindsay, of Boysack and Kinblethmont	1824
Carnegy, David, of Craigo	1827
Carruthers, Alexander, of Warmanbie	1826
Carruthers, William Thomas, of Dormont	1823
Carstairs, Drysdale, Merchant, Leith	1838
Carstairs, John, of Springfield	1841
Cassels, David, late Distiller at Arnprior	1824
Cathcart, Elias, of Blairston	1819
Cathcart, Taylor, of Carbiston and Pitcairly	1842
Cay, John, Advocate, Sheriff of Linlithgowshire	1841

	Admitted
Chalmers, Charles, of Monkshill	1824
Chalmers, David, of Westburn	1834
Chalmers, Patrick, of Auldbar	1834
Chalmers, James, Glenbirnam	1839
Chalmers, John, Ballumbie House, Dundee	1844
Chalmers, Lewis, Fraserburgh, Factor for Lord Saltoun	1833
Chambers, Robert, Edinburgh	1841
Chapman, David, Merchant, Glasgow	1845
Charge, Thomas of Bartom	1833
Cheape, Captain John, of Girgenti	1814
Cheape, George, of Wellfield	1834
Cheyne, Captain Alexander, Royal Engineers	1825
Cheyne, Henry, of Tangwick, W.S.	1838
Cheyne, James Auchinleck, of Kilmaron	1825
Chiene, George Tod, Factor for Islay	1838
Chiene, Patrick, Edinburgh	1820
Chisholm, Duncan Macdonell, of Chisholm	1839
Chisholm, John, of Stirches, Roxburghshire	1839
Chisholm, Lachlan, of Lochans	1831
Chrisp, James, Sandyknowe, Roxburghshire	1838
Christie, Charles Maitland, of Durie	1841
Christie James, Hillend, late Hon. East India Company's Service	1835
Christie, John, of Pitgorno	1843
Christie, Robert, Accountant, Edinburgh	1824
Christie, William Macpherson, Ballimore	1837
Christopher, Robert Adam Dundas, M.P.	1825
Chrystie, Captain Alexander, Hon. E.I.C.S.	1834
Chrystie, Thomas, Captain R.N.	1841
Church, James, junior, Tower of Sark	1838
Clapperton, Alexander, Merchant, Edinburgh	1838
Clapperton, Thomas, of Spyelaw, Merchant, Edinburgh	1837
Clark, Francis William, of Ulva	1838
Clark, James, of Boxton	1834
Clark, James, Wormiston	1842
Clarke, Dr. John, of Speddoch, M.D., K.H., Deputy Inspector General of Army Hospitals	1838
Clason, Andrew, W.S.	1820
Clason, the Rev. Dr. Patrick, Edinburgh	1838
Clayhills, Alexander, of Invergowrie	1838
Cleghorn, George of Weens	1821
Cobb, William, Mains of Fintray	1843
Cobbold, Charles, Broughton Park	1842
Cobbold, Robert Knipe, Carlton Rookery, Suffolk	1844
Cogan, Hugh, Merchant, Glasgow	1838
Cogan, John, Merchant, Glasgow	1838
Cogan, Robert, Merchant, Glasgow	1830

	Admitted
Collie, James, Farmer, Middleton of Fintry	1840
Collier, John, Hatton, Muirdrum	1843
Collier, Thomas, Hatton, Factor to the Right Hon. Lord Panmure	1835
Collier, William, Merchant, Dundee	1843
Colquhoun, John, Advocate, Sheriff of Dumbartonshire	1807
Colquhoun, John Campbell, of Killermont	1824
Colquhoun, William Hanson, Sheriff-Substitute, Inverness	1839
Colquhoun, William Lawrence, of Clathick	1838
Colt, John Hamilton, of Gartsherrie	1844
Colville, William, of the Laws, Dundee	1843
Condie, James, Blackfriar's House, Perth	1839
Connal, William, Merchant, Glasgow	1838
Connell, James, of Conheath	1843
Cook, John, W.S.	1841
Cooper, Henry R., of Ballindalloch	1845
Cooper, William, of Failford	1845
Copland, David, Merchant, Aberdeen	1833
Copland, William, of Collieston	1836
Cordiner, William, Memsie, Frasersburgh	1841
Corrie, Hugh, younger of Steilston	1844
Corrie, Thomas, of Culloch, Manager British Linen Co.	1826
Coulter, John, Tylefield, Glasgow	1833
Couper, Peter, W.S.	1811
Cowan, Alexander, Merchant, Edinburgh	1810
Cowan, Charles, Valleyfield	1836
Cowan, David, 7, York Place, Edinburgh	1844
Cowan, Duncan, Merchant, Edinburgh	1810
Cowan, James G., Drummond Place, Edinburgh	1840
Coventry, Andrew, of Pittillock, Advocate	1844
Craig, Alexander, Merchant, Edinburgh	1818
Craig, Alexander, Kirkton	1821
Craig, James, Surgeon, Ratho	1841
Craig, John, Merchant, Edinburgh	1818
Craig, William Gibson, younger of Riccarton, M.P.	1824
Craigie, David, Cashier, Perth Banking Company	1842
Craigie, Lawrence, of Glendoick	1824
Cranstoun, George, of Corehouse	1819
Craufurd, James, younger of Ardmillan, Advocate	1835
Crawford, Charles, East Fortune	1822
Crawford, David, Writer, Greenock	1844
Crawford, John Innes, of Bellfield	1815
Crawford, John, Sharpitlaw House, near Kelso	1826
Crawford, John, of Auchinames	1818
Crawford, John, late British Resident at Java	1819
Crawford, William, of Doonside	1836
Crawford, William Macknight, of Cartsburn	1809

	Admitted
Crawford, William Howison, of Crawfordland	1809
Crawford, W. S. S., of Milton	1838
Crichton, Adam, Factor to the Marquis of Bute, Dumfries House	1838
Crichton, David Maitland Mackgill, of Rankeillor	1826
Crichton, Hew, Park Place, Edinburgh	1838
Crichton, John, M.D., of West Grange of Cronon	1843
Crichton, Thomas, Provost of Dumfries	1845
Crichton, Thomas, of Auchinskeoch	1795
Crombie, Alexander, late of Phesdo	1835
Crombie, Lewis, Aberdeen	1834
Crooks, John, of Leven	1838
Cruickshank, Alexander, of Keithock	1836
Cross, David, Seed-Merchant, Glasgow	1845
Crow, James, at Kincraig	1826
Crum, Walter, of Thornliebank	1844
Crum, John, Thornliebank	1845
Cumming, Alexander, of Grishernish	1837
Cumming, Alexander, younger of Grishernish	1839
Cumming, Alexander, Merchant, Inverness	1839
Cumming, James, Factor to Sir William Maxwell of Monreith, Bart.	1841
Cumming, Lachlan, Comptroller of Customs, Inverness	1839
Cunningham, Alexander, of Balgounie	1841
Cunningham, Alexander, Morebattle Tofts	1841
Cunningham, Colonel John, of Newton	1829
Cunningham, John, of Duchrae	1830
Cunningham, John Sinclair, Banker, Edinburgh	1833
Cunningham, John Smith, of Caprington	1835
Cunningham, Thomas Smith, younger of Caprington	1835
Cunningham, William, of Lainshaw	1810
Cunningham, William, at Goodleyburn	1830
Cunningham, William, of Craigends	1828
Cunningham, William A., of Logan	1836
Cuninghame, Alexander, of Craigends	1844
Currie, Alexander, Advocate, Sheriff of Banffshire	1836
Currie, William, of Linthill	1832
Cuthbertson, Allan, Accountant, Glasgow	1844
Cuthbertson, Archibald, Greendykes	1822
Cuthbertson, Donald, Accountant, Glasgow	1827
Cuthbertson, William, Merchant, Glasgow	1836

D

Decazes, The Duc, Peer of France, President of the Council of Agriculture, Honorary Member	1836
Downshire, The Most Noble Arthur, Marquis of, K.P. Honorary Member	1837

	Admitted
DOUGLAS and CLYDESDALE, The Most Noble William Anthony Alexander, Marquis of	1834
DUCIE, Right Hon. Thomas, Earl of	1843
†DALHOUSIE, The Right Hon. James, Earl of	1835
DUNMORE, The Right Hon. Alexander Edward, Earl of	1837
DALMENY, The Right Hon. Archibald, Lord, M.P.	1833
DUFFUS, The Right Hon. George, Lord	1839
DUNCAN, Right Hon. Adam Viscount	1843
DOUGLAS, The Right Hon. Archibald, Lord	1825
†DUNFERMLINE, The Right Hon. James, Lord	1834
DOUGLAS, The Right Hon. Lord Wm. R. Keith, of Denino	1819
DUNDAS, The Right Hon. William, Lord Clerk-Register	1801
DUFF, General the Hon. Sir Alexander, of Delgaty	1814
DOUGLAS, Hon. Charles, of Douglas	1806
DUNBAR, The Hon. Robert, of Latheron Wheel	1832
DALYELL, Sir John Graham, of Binns, Bart.	1807
DALRYMPLE, Sir Hew, of North Berwick, Bart.	1841
DUNBAR, Sir Archibald, of Northfield, Bart.	1794
DICK, Sir Robert Keith, of Prestonfield, Bart.	1816
DUNDAS, Sir David, of Dunira, Bart.	1828
DRUMMOND, Sir James Walker, of Hawthornden, Bart.	1834
DURHAM, Admiral Sir P. C. Henderson, of Fordel. G.C.B.	1823
DRUMMOND, Vice-Admiral Sir Adam, of Megginch	1822
D'ESTE, Colonel Sir Augustus Frederick	1822
DICK, Major-General Sir R. H., of Tullimet, K.C.B.	1828
Dalgairns, Lieutenant-Colonel, of Balgavies	1841
Dalgleish, A. Stephenson, Merchant, Glasgow	1838
Dalgleish, Robert, Merchant, Glasgow	1838
Dalrymple, Captain James Elphinstone, of Westhall	1840
Dalrymple, North, of Fordel	1843
Dalzell, James Allen, Whitehouse	1835
Darling, Peter, Croft House, Banker, Kelso	1841
Darling, William, Farmer at Stircoke, Caithness	1839
Darroch, Lieutenant-General Duncan, of Gourock	1830
Darroch, Captain Duncan, younger of Gourock	1840
Daubeny, Robert Henry, of Bristol	1826
Davidson, David, Merchant, Pulteneytown	1839
Davidson, Duncan, of Tulloch	1824
Davidson, Duncan, of Inchmarlo	1824
Davidson, Henry M., Haddington	1841
Davidson, Hugh, Chief Magistrate of Thurso	1839
Davidson, Hugh, of Cantray	1831
Davidson, James of Ruchill, Merchant, Glasgow	1838
Davidson, James, Keeper of the Records of the Court of Session	1834
Davidson, Lawrence, W.S.	1829
Davidson, Patrick, younger of Inchmarlo	1834

	Admitted
Davidson, Robert, Advocate	1819
Davidson, William, of Kebbaty	1841
Davidson, William, Stanstill	1833
Davidson, William, Writer, Glasgow	1838
Deans, John, Penston, Tranent	1841
Deas, George, Advocate	1838
De Lisle, Robert, of Acton Park, Yorkshire	1838
Dempster, George, of Skibo	1823
Denham, John, Tacksman of Dunglass	1839
Dennistoun, William, Oakmount, Lasswade	1841
Dennistoun, James R., Merchant, Glasgow	1838
Dennistoun, John, of Golfhill, M.P.	1838
Denny, Peter, Provost of Dumbarton	1838
Denoon, David, Solicitor, Inverness	1839
Dewar, Alexander Cumming, Vogrie, H.E.I.C.S.	1832
Dewar, James, of Vogrie	1842
Dewar, John, Advocate	1830
Dick, John, Advocate	1827
Dick, Professor, Veterinary College, Edinburgh	1840
Dick, William, younger of Pitkerro	1828
Dickson, Archibald, of Huntlaw	1823
Dickson, George, of Huntlaw	1830
Dickson, George, of Belchester	1831
Dickson, James Wardrobe, Advocate, Sheriff-Substitute, Falkirk	1834
Dickson, John, of Peelwalls	1838
Dickson, John, Saughton Mains, Edinburgh	1844
Dickson, Walter of Monybuie, W.S.	1842
Dirom, Lieut.-Colonel John, of Mountannan	1838
Dixon, William, of Govanhill, Merchant, Glasgow	1827
Dodd, William, Merchant, Glasgow	1837
Dodds, John, Factor to the Earl of Stair	1844
Donaldson, James, of Thornwood	1839
Donaldson, James, of Keppoch	1845
Donaldson, John, of Auchairn, W.S.	1812
Donaldson, John, Advocate	1835
Dougal, John, of Glenferness	1844
Dougall, William Stark, of Scotscraig	1844
Douglas, Archibald, of Adderstone	1822
Douglas, Archibald, of Glenfinart	1836
Douglas, Francis Brown, Advocate	1839
Douglas, George, Advocate, Sheriff of Kincardineshire	1800
Douglas, James, of Cavers	1835
Douglas, Robert Johnstone, of Lockerbie	1842
Douglas, Thomas D., Merchant, Glasgow	1838
Dove, William, Baillieknow, near Kelso	1845
Downie, Alexander, Merchant, Glasgow	1835

	Admitted
Downie, John, Merchant, Glasgow	1838
Drimmie, Daniel, Panmure Bleachfield, Dundee	1843
Drew, Laurence, Carmyle, Glasgow	1844
Dron, William, of Blackruthven	1829
Drummond, George Harley, late of Drumtochty	1810
Drummond, Henry Home, of Blair Drummond, M.P.	1809
Drummond, George Home, younger of Blair Drummond	1835
Drummond, John George Home, of Abbotsgrange and Millearn	1835
Drummond, Thomas, of Newton	1828
Drummond, William, Banker, Cupar Fife	1837
Dudgeon, John, Spylaw	1840
Dudgeon, Patrick, of Eastcraigs, W.S.	1827
Dudgeon, Robert, Merchant, Liverpool	1828
Dudgeon, William, Merchant, Leith	1826
Duff, Alexander, W.S.	1842
Duff, The Rev. David, Minister of Kenmore	1839
Duff, Garden, of Hatton	1814
Duff, James, yr. of Delgaty, M.P. for Banffshire	1840
Duff, James Grant, of Eden	1828
Duff, Robert, of Fetteresso	1823
Duff, Richard Wharton, of Orton	1805
Duff, Thomas Abercromby, of Haddo	1835
Dunbar, Archibald, younger of Northfield	1839
Dunbar, Major P., of Mountcoffer	1823
Duncan, Alexander, of Glendivine	1824
Duncan, George, M.P. for Dundee	1843
Duncan, George, Balchrystie, Fifeshire	1838
Duncan, James, at Cargill	1826
Duncan, James, Merchant, Leith	1826
Duncan, Rev. James, Nelson Street, Edinburgh	1845
Duncan, John, Manufacturer, Aberdeen	1840
Dundas, Gabriel Hamilton, late of Duddingston	1823
Dundas, Captain Henry, R.N.	1842
Dundas, Lieut.-Colonel Thomas, of Carronhall	1839
Dunlop, Alexander, Advocate	1828
Dunlop, Andrew, W.S.	1841
Dunlop, Anthony, of Balnakeil	1840
Dunlop, Archibald, 42, Ebury Street, London	1823
Dunlop, Campbell, late Enterkine House	1832
Dunlop, Henry, of Craigton	1838
Dunlop, James, of Annanhill	1824
Dunlop, James, of Macnairston, W.S.	1823
Dunlop, James, of Perryston	1844
Dunlop, James, of Arthurlee	1844
Dunlop, John, of Brockloch	1836
Dunn, William, of Duntocher, Merchant, Glasgow	1827

	Admitted
Dunsmure, James, late Secretary Herring Fishery Board	1817
Dykes, Fretcheville Lawson Ballantyne, of Dovenby Hall, Cumberland	1845
Dyson, Thomas C., of Willowfield, Halifax, Yorkshire	1832

E

Esterhazy, His Highness the Prince, Hungary, Honorary Member	1836
†Erroll, The Right Hon. William George, Earl of, K.T.	1837
†Eglinton, The Right Hon. Archibald, Earl of	1834
Elgin and Kincardine, The Right Hon. James, Earl of	1842
Elibank, The Right Hon. Alexander, Lord	1836
†Elcho, The Right Hon. Francis, Lord	1819
Egerton, The Right Hon. Lord Francis, M.P.	1822
Elphinstone, The Right Hon. John, Lord	1834
Emlyn, The Right Hon. John Frederick, Viscount	1839
Elphinstone, The Hon. Mountstuart	1833
Elliott, Sir William Francis, of Stobbs, Bart.	1823
Edmonstone, Sir Archibald, of Duntreath, Bart.	1821
Elphinstone, Sir Robert Dalrymple Horn, of Logie-Elphinstone, Bart.	1813
Eccles, William, Merchant, Glasgow	1838
Eccles, William, jun. Merchant, Glasgow	1838
Eddington, Smollett Montgomery, of Gleneveggan	1844
Eddington, Thomas, Merchant, Glasgow	1813
Edington, John, Cameron, Windygates	1845
Edmonstone, Archibald, Architect and Builder, Glasgow	1838
Edmonstone, Charles, of Cardross Park	1838
Edmonstone, Thomas, of Buness, Zetland	1838
Edward, Allan, Merchant, Dundee	1843
Edwards, James, Flax-spinner, Dundee	1844
Elder, John, Merchant, Slate	1815
Ellice, Edward, M.P.	1836
Elliot, George Scott, late of Larriston	1813
Elliot, James, of Wolflie	1826
Ellis, William, S.S.C.	1821
Elphinstone, Lieutenant-Colonel John	1827
Erskine, Alexander, of Bellhall and Longhaven	1843
Errington, Rowland, of Sandhoe	1841
Erskine, James of Cambus	1808
Erskine, Thomas, Linlathen, Broughty-Ferry	1843
Erskine, Col. William Howe Knight, of Pitodrie	1820
Ewart, Archibald, Depute-Clerk of Chancery	1839
Ewing, Alexander, of Tartowie, M.D., Aberdeen	1841
Ewing, Alexander, 2, Woodside Place, Glasgow	1844
Ewing, James, of Levenside	1827
Ewing, James Lindsay, of Caldercruix	1844

	Admitted
Ewing, John Orr, residing at Croft, by Dumbarton	1838
Ewing, Robert, Merchant, Greenock	1830
Ewing, William Leckie, of Arngomery	1835

F

†Fife, The Right Hon. James, Earl of, K.T.	1805
Forbes, The Right Hon. Walter, Lord	1833
Fitzclarence, The Right Hon. Lord Frederick	1841
Flahault, Charles, Count Mercer De	1821
Forbes, Sir John Stuart, of Pitsligo and Fettercairn, Bart., Treasurer of the Society	1830
Forbes, Sir John, of Craigievar, Bart.	1832
Fairlie, Sir John Cuninghame, of Fairlie and Robertland, Bart.	1844
Foulis, Sir William Liston, of Colinton, Bart.	1843
Ferguson, Sir Charles Dalrymple, of Kilkerran, Bart.	1826
Forbes, Sir Charles, of Newe and Edinglassie, Bart.	1814
Forrest, Sir James of Comiston, Bart.	1805
Ferguson, Sir Adam, Kt., Keeper of the Regalia	1799
Farquhar, Rear-Admiral Sir Arthur, R.N. C.B.	1826
Fraser, Major-General Sir Hugh, of Braelangwell, K.C.B.	1839
Fairbairn, T., late of St. Vincent's	1802
Fairlie, James, of Holmes	1827
Fairlie, James Ogilvie, of Williamfield	1836
Falconer, George, of Carlowrie	1837
Falconer, Cosmo, of Hartwoodhill	1805
Farquhar, Lieut.-Colonel William, Madras Engineers, late British Resident at Singapore	1827
Farquhar, Nathaniel, Advocate, Aberdeen	1840
Farquharson, Andrew, yr. of Whitehouse, Aberdeen	1840
Farquharson, Major-General Francis, H.E.I.C.	1843
Farquharson, James of Invercauld	1831
Farquharson, John, of Haughton	1808
Farquharson, Major John, of Corrachrie, Tarland	1841
Farquharson, Peter, of Whitehouse	1833
Farquharson, Robert, of Allargue	1845
Farquharson, Thomas, of Baldovie	1836
Fector, J. Minet, M.P., London	1840
Fenton, John, Mill of Mains, Dundee	1843
Fergus, John, of Strathore	1832
Ferguson, George, of Pitfour	1828
Ferguson, James, of Kinmundy	1826
Ferguson, John, late of Stronvar	1805
Ferguson, John, of Knockindale	1824
Ferguson, Adam, of Woodhill, Member of the Honourable Legislative Council of Canada	1807
Ferguson, James, W.S.	1826
Ferguson, Lieut.-Colonel James, of Huntly Burn	1831

	Admitted
Ferguson, John, Wine Merchant, Leith	1826
Ferguson, John, Wine-Merchant, late Provost of Inverness	1839
Ferguson, Lieut.-Colonel Robert, of Raith, M.P.	1845
Fergusson, Muir, of Middlehaugh	1842
Fergusson, Samuel R., W.S.	1836
Fernie, James Blyth, of Kilmux	1836
Ferrie, John, Merchant, Greenock	1831
Ferrier, Alexander, Bloomhill, near Dunbarton	1838
Ferrier, Charles, of Badingsgill, Accountant, Edinburgh	1833
Ferrier John, W.S.	1796
Findlay, Robert, of Easterhill, Banker in Glasgow	1838
Findlay, Robert, of Battarich	1844
Findlay, Alexander Struthers, of Castle Toward	1844
Findlay James, Castle Toward	1826
Finnie, John, Swanston Farm	1838
Fisher, Daniel, S.S.C.	1819
Fisher, James, M.D., late Staff Surgeon to the Army in Canada	1821
Fleming, John, of Claremont, Merchant, Glasgow	1838
Fleming, Lieutenant-Colonel, of Inistore	1839
Fleming, Robert, late of Tillichewen, Dunbartonshire	1838
Fleming, William Malcolm, of Barrochan, Vice-Lieutenant of the County of Renfrew	1832
Flemying, Robert Stewart, of Killiechaise	1826
Fletcher, Alexander, Merchant, Glasgow	1838
Fletcher, Angus, of Dunans, Advocate	1826
Fletcher, Angus, Sculptor, Cawara	1842
Forbes, Alexander, of Boyndlie	1840
Forbes, Alexander, Inverernan	1840
Forbes, Charles, of Asloun, second son of Sir Charles Forbes, Bart.	1828
Forbes, Charles Henry, of Kingerloch	1836
Forbes, George, Banker, Edinburgh	1817
Forbes, George, Merchant, Fitzroy Square, London	1830
Forbes, George, of Springhill	1835
Forbes, James D., Professor of Natural Philosophy, University of Edinburgh	1836
Forbes, James Stewart, fourth son of Sir Charles Forbes, Bart.	1830
Forbes, John, of Inverernan, H.E.I.C.S.	1842
Forbes, Lieutenant-General Nathanael, of Auchernach	1828
Forbes, Patrick, of St. Catherines	1834
Forbes, Peter, Wine-Merchant, Edinburgh	1838
Forbes, William, of Callender, M.P.	1830
Forbes, William, younger of Medwyn, Advocate	1835
Fordyce, Thomas J., late of Ayton	1828
Forgan, James, Writer, Dundee	1843
Forlong, William, of Erins, Argyllshire	1838

	Admitted
Forman, John Nairne, W.S.	1831
Forrest, James, Junior, Kirriemuir	1843
Forrester, John, W.S.	1842
Forrester, W. A., of Barns	1842
Forsyth, James, of Dunach	1838
Forsyth, John, Forres	1826
Foulds, William, of Skirnieland	1833
Fowler, James, of Raddrey	1806
Fowler, J. E. B., yr. of Raddrey	1839
Fox, George Lane, of Bramham Park	1842
Fox, Richard M., of Foxhall, Rathowen, Ireland, M.P.	1838
Fraser, Affleck, of Culduthel	1840
Fraser, Alexander, City Chamberlain, Aberdeen	1841
Fraser, Andrew, W.S., Sheriff-Substitute, Fort-William	1840
Fraser, Captain Alexander, Royal Engineers	1818
Fraser, Major Andrew, of Flemington	1837
Fraser, Archibald Thomas Frederick, of Abertarf	1820
Fraser, Colonel Charles, of Inverallochy and Castle Fraser	1816
Fraser, Evan Bailie, of Inchcoulter	1840
Fraser, Hugh, Abersky	1840
Fraser, James, B., of Relig	1839
Fraser, Captain James, of Ballindown	1839
Fraser, John, Cashier, Cullen House	1812
Fraser, John, York Terrace, London	1840
Fraser, John, Tacksman of Clury, Strathspey	1840
Fraser, John, Tacksman of Shewglie	1839
Fraser, John, Dumfries	1843
Fraser, Robert, of Torbreck	1802
Fraser, Robert, Brackla, Nairnshire	1839
Fraser, Capt. Thomas, of Balnain, R.N.	1839
Fraser, Dr. Thomas, Fasnakyle	1840
Fraser, Capt. William, residing at Brackla	1809
Fraser, William, of Glenmead, W.S.	1816
Fraser, Lieut.-Colonel William, Balmakewan	1838
Fraser, William, of Hillside and Skipness	1838
Fraser, William, junior, W.S.	1837
Freeland, Robert, of Gryffe Castle, Merchant, Glasgow	1835
Fullerton, Gavin, of Kerelaw	1844
Fullerton, Captain James, 30th Regiment	1824
Fullerton, Colonel S. M., of Fullerton	1825
Fullerton, John, of Demerara, Brisbane House	1825
Fullerton, John, of Kilmichael	1807
Fyfe, Andrew, M.D., Professor of Chemistry, King's College, Aberdeen	1823
G	
GORDON, Her Grace Elizabeth, Duchess of	1834
†GALLOWAY, The Right Hon. Randolph, Earl of	1830
GLASGOW, The Right Hon. George, Earl of	1822

	Admitted
Gray, The Right Hon. John, Lord	1821
Glenlyon, The Right Hon. George, Lord	1834
Glenlyon, The Right Hon. Lady	1841
Glenelg, The Right Hon. Charles, Lord	1816
Graham, The Right Hon. Lord Montague William	1831
Graham, The Right Hon. Sir James Robert George, of Netherby, Bart., M.P.	1830
Gordon, Capt. The Hon. William, R.N., M.P.	1824
Gordon, the Right Hon. Sir Robert Balmoral, G.C.B.	1834
Gordon, Sir William Cumming, of Altyre and Gordonston, Bart.	1808
Gibson, Sir Alexander C. Maitland, of Cliftonhall, Bart.	1818
Grant, Sir George Macpherson, of Ballindalloch and Invereshie, Bart.,	1806
Grant, Sir John Peter, of Rothiemurchus, Knight, Judge in the Supreme Court, Calcutta	1792
Gordon, Sir Charles, of Drimnin, Kt., Secretary of the Society	1835
Galbraith, John, younger of Buckieburn	1838
Galbraith, Robert, of Greenhead, Merchant, Glasgow	1838
Galbraith, William, of Blackhouse, Sheriff-Clerk of Stirlingshire	1822
Galbreath, David Stewart, of Mackrihanish	1812
Gallaway, William, Accountant, Edinburgh	1814
Garden, Alexander, Merchant, Glasgow	1827
Gardiner, John, at Smithston	1830
Gardner, Hamilton Gray, W.S.	1844
Gardner, John, of Springbog	1844
Gardner, Richard, Dudhope House	1841
Gardyne, Major William Bruce, of Middleton	1843
Garioch, John, of Heathcote	1826
Gartshore, John Murray, of Gartshore	1825
Geddes, Adam G., Paymaster, late 3d Garrison Battalion, Newington	1819
Geddes, James, Orbliston	1843
Geddes, Lieut.-Col. John, K.H., late 27th Regiment	1842
Geekie Alexander, of Baldourie	1837
Geekie, Peter, Factor for the Earl of Mansfield at Scone	1837
Geekie, Robert, of Rosemount	1843
Geils, John Edward, of Dumbuck	1844
Gentle, Robert, Dell, Inverness-shire	1840
Gerard, Archibald, of Rochsoles	1842
Gerard, John Mair, of Midstrath	1834
Gibb, Elias, Merchant, Glasgow	1838
Gibbon, Alexander, of Johnston	1834
Gibbons, Edward, Factor to Macleod of Macleod	1830
Gibbs, Humphrey, Honorary Secretary, Smithfield Club, London	1840

	Admitted
Gibson, Alexander, of Glencrosh	1835
Gibson, Alexander Carmichael, younger of Castlecraig	1836
Gibson, John, W.S.	1825
Gibson, John, Jun., W.S.	1828
Gibson, Thomas, of Spittal, M.D.	1845
Gilchrist, Daniel, of Opisdale	1841
Giles, James, of Kailzie	1842
Gilbert, John Graham, of Yorkhill	1844
Gilfillan, James, of Cowdenknows	1841
Gillanders, F. M., of Newmore	1844
Gillespie, Alexander, Surgeon, Edinburgh	1806
Gillespie, Alexander, Merchant, Gould Square, London	1836
Gillespie, David, of Mountquhannie	1841
Gillespie, James, Parkhall	1829
Gillespie, Robert, Merchant, London	1829
Gillespie, Robert, of Cambus-Wallace	1842
Gillespie, Thomas, Park Hall	1842
Gillespie, Thomas, of Ardochy	1821
Gillespie, William, Gateside	1829
Gillon, William Doune, of Wallhouse	1823
Gilmour, Walter James Little, of Craigmillar	1828
Gilmour, William, of Oatlands, Merchant, Glasgow	1838
Gilmour, William, Maryland, President of the Renfrewshire Agricultural Society	1844
Gilly, The Rev. Stephen, D.D., Vicar of Norham	1841
Gladstone, John, of Fasque	1833
Gladstone, Robertson, Merchant, Liverpool	1841
Gladstone, Thomas, younger of Fasque	1834
Glassford, James, of Dougaldston, Advocate	1806
Glasgow, R. Robertson, of Mountgreenan, Advocate	1838
Glen, Alexander, of Demerara	1841
Goalen, Alexander, Star Bank, Newhaven	1805
Goldie, Alexander, of Broomlee, W.S.	1822
Goldie, The Rev. Thomas S., Coldstream	1833
Gollan, John, of Gollanfield	1839
Goodwin, Lieutenant-Col. Hugh Maxwell, of Mount Alyn, Denbighshire	1830
Gordon, Captain Alexander, R.N.	1820
Gordon, Alexander, of Auchlunies	1808
Gordon, Alexander, George Square, Edinburgh	1817
Gordon, Alexander, of Newton	1841
Gordon, Charles Napier, of Esslemont	1840
Gordon, Charles, late of Auchluchries	1832
Gordon, Captain Charles, R.N.	1835
Gordon, Edward Stratherne, Advocate, Edinburgh	1840
Gordon, Francis, yr. of Abergeldie	1841
Gordon, Francis, of Kincardine	1835

	Admitted
Gordon, George, Muiryfold	1829
Gordon, James, of Manar	1835
Gordon, James, Revack, Ivy Bank	1813
Gordon, James, of Xeres-de-la Frontera	1834
Gordon, James Adam, of Knockespock	1843
Gordon, John Thomson, Advocate	1841
Gordon, Colonel John, of Cluny	1807
Gordon, John, of Aikenhead	1838
Gordon, John David, of Wardhouse	1828
Gordon, John, of Cairnbulg, Advocate	1811
Gordon, John, late Major of the 2d or Queen's Regiment	1822
Gordon, John, Tacksman of Croughly and Campdalemore	1839
Gordon, John Taylor, of Nethermuir	1831
Gordon, Joseph, W.S.	1804
Gordon, Michael Francis, of Abergeldie	1831
Gordon, Peter Charles, yr. of Wardhouse	1834
Gordon, Peter Laing, of Craigmile	1834
Gordon, Richard, Accountant, Edinburgh	1845
Gordon, Robert, of Jamaica	1802
Gordon, Lieutenant-Colonel Thomas, of Park	1825
Gordon, William, of Fyvie,	1834
Gordon, William, of Culvennan	1845
Gordon, Major-Gen. W. A., late 50th Regiment, K.C.B.	1818
Gordon, Captain William, H.E.I.C. Service, residing at Newton	1828
Govan, John, W.S.	1809
Gracie, John Black, W.S.	1834
Græme, Major George Drummond, of Inchbraikie	1839
Græme, Robert, of Garvock	1824
Graham, Major David, of Meiklewood	1831
Graham, Frederick, Factor to the Duke of Atholl	1821
Graham, Alexander, of Capilly	1844
Graham, Charles Maxwell, Glasgow	1844
Graham, George, late of Cassafuar	1817
Graham, George, of Shaw	1826
Graham, Henry, Surgeon, Shandwick Place, Edinburgh	1839
Graham, Humphrey, W.S.	1819
Graham, James, of Leitchtown	1827
Graham, James Gillespie, of Orchill	1806
Graham, James, of Ferenzie	1843
Graham, James Maxwell, Glasgow	1844
Graham, John, at Newbigging	1829
Graham, John, Pearsie, Kirriemuir	1843
Graham, Patrick, of Limekilns	1836
Graham, Robert, of Balgowan	1817
Graham, Robert, M.D., Professor of Botany in the University of Edinburgh	1821

	Admitted
Graham, Robert, Merchant, Leith	1826
Graham, Robert Stirling, of Kingauldrum	1841
Graham, William Stirling, of Airth	1833
Graham, William, Writer, Glasgow	1828
Graham, Lieut.-Colonel William, of Mossknow	1834
Graham, William, jun., of Finnartmore	1844
Graham, William C. Cuningham, of Gartmore	1796
Grainger, John, Factor to the Marquis of Lothian, at Mounteviot	1836
Grainger, Thomas, Civil Engineer, Edinburgh	1841
Grant, Alexander, of Aberlour	1810
Grant, Major Charles, Aberdeen	1816
Grant, Dougal, York Place, Edinburgh	1833
Grant, Duncan, of Bught	1825
Grant, George, Liverpool	1840
Grant, James M., of Glenmoriston and Moy	1810
Grant, Rev. James, D.D., St Mary's Church, Edinburgh, Chaplain to the Society	1828
Grant, James Augustus, of Viewfield	1840
Grant, John, of Kilgraston	1819
Grant, John Peter, W.S.	1823
Grant, John Macpherson, younger of Ballindalloch and Invereshie	1827
Grant, Patrick, W.S., Sheriff-Clerk of Inverness-shire	1836
Grant, Robert, of Kincorth	1826
Grant, Robert, of Tilliefour	1830
Grant, Robert, of Craighall	1841
Grant, Robert, Bookseller, Edinburgh	1842
Grant, Walter Colquhoun, Lieut. Royal Scots Greys	1844
Grant, William, younger of Elchies	1833
Grant, W. P., younger of Rothiemurchus	1821
Grant, William, Tacksman of Ruthven, Banffshire	1839
Grassick, Charles, of Tillypronie, residing at Buchaam	1830
Grassick, John, Mains of Glenbucket	1829
Grassick, Patrick, Littlewood Park	1842
Gray, Andrew Farquhar, of Glentig, Comptroller of the Customs, Glasgow	1835
Gray, Charles, Distiller, Glasgow	1838
Gray, James, of Auchengeich	1843
Gray, John, Merchant, Greenock	1831
Gray, Roderick, Factor at Peterhead for the Merchant Hospital of Edinburgh	1829
Gray, Stephen, of Mansfield	1838
Gray, William, of Blairbeth, Goldsmith, Glasgow	1838
Gray, William, late of Gibraltar, Merchant, Glasgow	1838
Greenhill, David, Grant Lodge	1842
Greenshields, John, of Kerse	1829

	Admitted
Gregorson, John, late of Ardtornish	1805
Gregory, Arthur Thomas, of Buchromb	1833
Gregg, James, Advocate, Sheriff-Substitute and Joint-Convener of Caithness	1839
Greig, James, junior, W.S.	1841
Greig, James, of Eccles, W.S.	1809
Greig, John, of Lethangie	1833
Grieve, Andrew, W.S.	1838
Grieve, James, Branxholm Braes	1842
Grieve, Thomas, Skelf-hill, Roxburghshire	1839
Grieve, William, of Branxholm Park	1834
Grindlay, Richard, Merchant, Leith	1842
Gulland, William Erskine, Stripeside	1833
Gunn, George, Factor on the Estate of Sutherland	1821
Gunn, James, Farmer at Glendhue, Sutherland	1839
Gunn, William, Farmer at Glendhue	1839
Guthrie, George, Factor to the Earl of Stair, Wigtonshire	1839
Guthrie, John, of Guthrie	1836
Guthrie, John, younger of Guthrie	1836
Guthrie, Major, Perth	1826
Gwynne, Alban Thomas Jones, of Monachty, Cardiganshire	1834
H	
*HAMILTON and BRANDON, His Grace Alexander, Duke of, K.G.	1804
†HUNTLY, The Most Noble George, Marquis of, K.T.	1793
HOME, The Right Hon. Cospatrick, Earl of	1843
†HADDINGTON, The Right Hon. Thomas, Earl of,	1804
HAY, The Right Hon. Lord John, Captain R.N.	1824
HALLYBURTON, The Right Hon. Lord John Frederick Gordon, M.P.	1844
HEPBURN, Sir Thomas Buchan, of Smeaton Hepburn, Bart. M.P.	1837
HERRIES, The Right Hon. J. C., M.P.	1832
HOPE, The Right Hon. Charles	1793
HOPE, John, The Right Hon. Lord Justice-Clerk	1823
HOPE, Sir John, of Craighall, Bart.	1808
HAY, Sir Adam, of Smithfield and Hayston, Bart.	1825
HALKET, Sir John, of Pitferrane, Bart.	1842
HALL, Sir John, of Dunglass, Bart.	1829
HAY, Sir James Dalrymple, of Park Place, Bart.	1816
HAY, Colonel Sir A. Leith, of Rannes, M.P.	1819
HOUSTON, Colonel Sir Robert, of Clerkington	1833
Hadden, Alexander, younger of Persley	1840
Hadden, James of Persley	1841
Hagart, Thomas, of Bantaskine	1826
Haggart, James Valentine, of Glendelvine	1844

	Admitted
Haig, Alexander, of Blairhill	1833
Haig, John, Cameron Distillery, Kirkaldy	1841
Halket, Charles Craigie, of Hallhill	1834
Hall, James, of Killean, Argyllshire	1839
Hall, John, Scibercross, Golspie	1841
Hall, John, of Mollance	1841
Hamilton, Archibald, of Carcluie, Capt. H.E.I.C.N.S.	1833
Hamilton, James, of Kames, W.S.	1807
Hamilton, James, of Barns	1828
Hamilton, John, of Sundrum	1839
Hamilton, John Ferrier, of Westport	1827
Hamilton, John, of Fairholm	1827
Hamilton, Montgomery, Captain, H.E.I.C. Naval Service	1836
Hamilton, Lieut.-Colonel R. Campbell, of Milburn and Dalserf	1804
Hamilton, Robert, W.S., Tiretigan	1842
Hamilton, Robert William, Agent, General Steam Navigation Company, Edinburgh	1814
Hamilton, William, Merchant, Glasgow	1823
Hamilton, William, of Craighlaw	1829
Handyside, Robert, Advocate, Sheriff of Stirlingshire	1841
Handyside, William, of Kirklands	1843
Hannay, John, Dalquhairn, Dumfries	1840
Hanning, John, Meikle Knox	1840
Harden, Robert Allan, 6, Doune Terrace, Edinburgh	1838
Harvey, Archibald, of Killelan, Merchant, Glasgow	1838
Harvey, Arthur, of Tillygreig	1838
Harvey, Lieut.-Col. James, of Castlesemple, K.H.	1823
Harvey, John Rae Lee, younger of Castlesemple	1836
Harvey, John, of Ichwell, Bury, and Tiningly Park, Yorkshire	1809
Harvey, Robert, of Pennygowan	1845
Harvey, William, Distiller, Yoker	1838
Harvie, Robert, Distiller, Port-Dundas	1838
Hastie, Archibald, M.P. for Paisley	1838
Hastie, Alexander, Merchant, one of the Magistrates of Glasgow	1843
Hay, Alexander, of Hardengreen	1837
Hay, David Ramsay, House Painter to the Queen	1842
Hay, George William, of Whiterig	1841
Hay, James, of Belton, Capt. R.N.	1820
Hay, James, Merchant, Leith	1828
Hay, John, of Letham	1834
Hay, John Stewart, of Rockville	1836
Hay, Robert, of Lawfield	1807
Hay, William, of Laxfrith	1828
Hay, William, of Dunse Castle	1819
Hay, William, of Hopes	1835

	Admitted
Heathcoat, John, M.P. for Tiverton, Honorary Member	1837
Hector, Alexander, Writer, Edinburgh	1824
Henderson, Alexander, Long Niddry	1837
Henderson, Alexander, of Gourdie, H.E.I.C.S.	1843
Henderson, Captain David, younger of Stemster	1829
Henderson, G. D. Clayhills, Hallyards, Perthshire	1843
Henderson, Duncan, M.D., 78th Regiment	1825
Henderson, James, Distiller, Pulteneytown	1839
Henderson, John, W.S., Wick	1839
Henderson, John, of Park, Merchant, Glasgow	1838
Henderson, John Alexander, of Westerton, 4th or Queen's Own Light Dragoons	1831
Henderson, John Irving, Advocate, Sheriff-Substitute, Dundee	1823
Henderson, Robert, Merchant, Glasgow	1838
Henry, John, of Corse	1815
Hepburn, John Stewart, of Colquhalzie	1810
Herries, William Young, of Spotts	1823
Heriot, John, of Foley Hills	1828
Heriot, James, of Ramornie	1800
Heron, James, of Dalmore	1833
Hewatson, Robert, Auchenbenzie	1834
Hewetson, James, Provost of Castle-Douglas	1840
Hill, Charles, of Luthrie	1842
Hill, George Gosset, Merchant, London	1823
Hill, Henry David, W.S.	1825
Hill, Lawrence, of Barlanark, Writer, Glasgow	1838
Hill, Norman, of Brownhills, Advocate	1807
Hill, Robert, of Firth, W.S.	1800
Hog, James Maitland, of Newliston and Kellie	1835
Hogarth, George, Banker, Cupar-Fife	1842
Hogarth, John, Akeld, Northumberland	1841
Home, Francis, 29, York Place, Edinburgh	1829
Home, Major-General James, of Broomhouse	1829
Home, Lieut.-Colonel J. H., of Bassendean, Grenadier Guards	1834
Home, John Foreman, of Wedderburn	1830
Home, William Foreman, of Billy and Paxton	1823
Hood, David, of Balluderon	1834
Hood, John, of Stoneridge	1827
Home, G. Binning, of Argaty	1831
Hope, Archibald, younger of Craighall and Pinkie	1832
Horn, John, of Thomanean	1837
Horne, Archibald, Accountant, Edinburgh	1828
Horne, Donald, of Langwell	1817
Horne, William, of Scouthell, Advocate, Sheriff of Haddington	1813

	Admitted
Horrocks, John, late of Tullichewan Castle	1818
Horsburgh, Major William Henry	1824
Horsburgh, Robert, Factor for the Duke of Sutherland, Tongue House	1841
Hosier, James, of Newlands, Advocate	1822
Hotchkis, James, residing at Castlemilk	1838
Houldsworth, Henry, of Cranstonhill	1836
Houldsworth, John, Merchant, Glasgow	1838
Houldsworth, Thomas, of Coltness	1837
Houston, Major A., younger of Clerkington	1845
Houston, Ludovick, of Johnstone Castle	1823
Houston, Thomas, at Kintradwell	1821
Howard, Lieut.-Colonel, late North British Staff	1809
Howat, Robert Kirpatrick, of Mabie	1841
Howden, Francis, Factor, Falkland	1842
Howden, James, Jeweller, Edinburgh	1827
Howden, John, Ugston, Haddington	1840
Hughan, Thomas, of Airds	1838
Huggins, W. B., of New York	1844
Hume, Joseph, of Horndean and Lochcote	1840
Hume, Peter Hallyburton, Lawfield, Dunbar	1840
Hunt, James, of Pittencrief and Logie	1816
Hunt, William, younger of Pittencrief and Logie	1836
Hunter, Alexander, W.S.	1824
Hunter, Andrew, of Bonnington	1819
Hunter, Charles, residing at Templehall	1826
Hunter, Charles, of Seaside and Glencarse	1823
Hunter, David, of Blackness	1826
Hunter, James, of Templehall	1823
Hunter, Captain James, of Auchterarder	1823
Hunter, James, of Hafton	1833
Hunter, James William, of Thurston	1842
Hunter, John, Oxenford Mains	1842
Hunter, John, Ardrossan	1836
Hunter, John, younger of Bonnington	1836
Hunter, Robert, Glenocher	1842
Hunter, Robert, Advocate, Sheriff of Buteshire	1843
Hunter, Richard, late Bengal Civil Service	1837
Hunter, William Hugh, Perth	1836
Hunter, William, of Ormiston	1812
Hussey, William, of Newhall, Merchant, Glasgow	1838
Hutchinson, James, Merchant, Glasgow	1838
Hutchison, Graham, Merchant, Glasgow	1838
Hutchison, John, junior, Monyruie	1841
Hutchison, Robert, Merchant, Glasgow	1838
Hutchison, Robert, younger of Cairngall	1829
Hutton, Thomas, Grainbank, Kirkwall	1844

	Admitted
Hyett, Henry W., of Painswick	1841

I

Ivory, The Hon. Lord	1833
Inglis, David, Kincaidfieldhouse, Stirling	1845
Inglis, James P., late Merchant, Leith	1806
Inglis, John, of Redhall	1825
Innes, Alexander, of Cowie	1840
Innes, Alexander Mitchell, younger of Ayton	1842
Innes, Cosmo, Advocate, Sheriff of Elginshire	1840
Innes, Dr. James, H.E.I.C.S.	1839
Innes, James Rose, of Netherdale	1827
Innes, Robert of Thrumster	1824
Innes, Thomas Mitchell, Phantassie	1842
Innes, William Mitchell, of Parson's Green	1819
Innes, William, of Raemoir	1834
Ireland, William, of Barbey	1837
Irvine, Alexander Forbes, of Shivas	1805
Irving, Alexander Forbes, younger of Drum	1845
Irvine, The Rev. Alexander Robertson, Minister of Foss	1838
Irving, George Vere, of Newton	1844
Irvine, Patrick, of Inveramsay, W.S.	1827
Irvine, William Stewart, M.D., Pitlochrie	1843
Irving, John, of Burnfoot	1838

J

Johnstone, The Hon. Henry Butler, of Corehead	1842
Jardine, Sir William, of Applegarth, Bart.	1823
Jardine, Sir Henry, of Harwood, Knight	1799
Jameson, Alexander, 17 Graham Street, Edinburgh	1842
Jameson, Robert, Professor of Natural History in the University of Edinburgh	1820
Jamieson, John, 18 Rutland Square	1844
Jardine, James, Civil-Engineer, Edinburgh	1818
Jardine, John, Advocate, Sheriff of Ross and Cromarty	1833
Jeffreys, Captain George, of Sunwick	1840
Jerdan, George, of Grange, Secretary Union Agricultural Society	1832
Jobson, Robert, Auchterhouse, Dundee	1843
Johnstone, George, Factor to the Earl of Eglinton	1822
Johnston, Alexander, of Shieldhall	1838
Johnston, Alexander, W.S.	1819
Johnston, Alexander, W.S., Aberdeen	1836
Johnston, Henry, Surgeon, Edinburgh	1798
Johnston, James, of Alva	1828
Johnston, James, Tibbermalloch	1836
Johnston, John, Factor for the Earl of Glasgow	1833

	Admitted
Johnston, Andrew, of Halleaths	1838
Johnston, Rear-Admiral Charles, of Cowhill, R.N.	1830
Johnston, Charles Kinnaird, Alva, Captain H. E. I. Co.'s Naval Service, and Knight of the Lion and Sun	1839
Johnston, Robert, Merchant, Aberdeen	1839
Johnstone, John James Hope, of Annandale, M.P., Honorary Secretary of the Society	1824
Johnstone, Thomas, of Underwood	1812
Johnstone, Walter, of Bodesbeck	1829
Johnstone, William, Banker, Girvan	1833
Johnstone, William, Merchant, Greenock	1825
Johnstone, William James Hope, younger of Annandale	1845
Jollie, Walter, W.S.	1829
Jolly, David Leitch, Banker, Perth	1829
Jolly, Stewart, Chamberlain to the Duke of Montrose	1827
Jolly, William Gardiner, Catter, Dumbarton	1845
Jopling, Thomas, Castlelaw	1823
Jopp, Alexander, Advocate, Aberdeen	1834

K

†Kinnoul, The Right Honourable Thomas, Earl of	1806
Kenmure, The Right Honourable Adam, Viscount	1841
Kinnaird, The Right Honourable George William, Lord	1830
Kennedy, The Right Honourable T. F., of Dunure	1812
Keith, Captain, The Honourable John, R.N.	1842
Kinloch, Sir David, of Gilmerton, Bart.	1828
Keir, Major-General Sir William Grant, K.C.B.	1804
Kaye, Robert, of Millbrae	1844
Keir, John, of Westfield	1832
Keir, Patrick Small, of Kinmonth, Advocate	1805
Keir, Patrick, younger of Kinmonth, Advocate	1837
Keith, Alexander, Netherthird	1837
Keith, William, Accountant, Edinburgh	1821
Kennedy, Donald, of Bogbain	1838
Kennedy, Gilbert, Glasgow	1838
Kennedy, Hugh Ferguson, of Bennan and Finnarts	1832
Kennedy, John, of Kirkland, Tacksman of Fassfern, &c.	1839
Kennedy, John, of Milton Park, Ardwick House, Manchester	1830
Kennedy, John, of Underwood, W.S.	1836
Kennedy, Robert Thomson, of Daljarroch	1833
Kennedy, William, Factor for Sir J. M. Riddell, Bart.	1842
Kennedy, William Primrose, of Drumellan	1842
Ker, James, of Blackshiels	1825
Ker, Captain James, of Grange and Carskerdo	1836
Ker, Christopher, Town-Clerk, Dundee, Factor for Lord Warncliffe	1843

	Admitted
Kerr, James, of Middlebank	1838
Kerr, Robert, Surgeon, Portobello	1816
Kerr, Robert, of Argrennan	1842
Kerr, William Scott, of Chatto	1833
Kidston, Archibald G., Ironmaster, Glasgow	1844
Kilgour, Robert, jun. at Millbank	1826
King, Charles Alexander, of Woodnuick	1844
King, William, Manufacturer, Glasgow	1839
Kinloch, George, of Kinloch	1825
Kinloch, Colonel John, of Kilrie	1829
Kinloch, Alexander John, of Park	1841
Kinnaird, Lieut.-Col. D., H.E.I.C.S., Meadow Place, Edinburgh	1839
Kinnear, Charles, of Kinnear	1824
Kinnear, Patrick, younger of Lochton	1823
Kippen, William, of Busbie	1838
Kirk, John, Merchant, Wick	1839
Kirkaldy, George D. H., of Hearensbrooke, Eyrecourt, Ireland	1844
Kirkaldy, James, Blackness House, Dundee	1839
Knight, George, of Jordanstown	1833
Kyle, Captain Alexander, of Binghill	1835

L

LANSDOWNE, the Most Noble Henry, Marquis of, K.G., Honorary Member	1837
LORNE, the Most Noble George, Marquis of	1844
†LEVEN and MELVILLE, Right Hon. David, Earl of	1820
LOVAT, The Right Hon. Thomas Alexander, Lord	1820
LUMSDEN, The Hon. James, Lord Provost of Glasgow	1838
LIVINGSTONE, Rear-Admiral Sir Thomas, of West Quarter, Bart.	1815
LAWRIE, Vice-Admiral Sir Robert, of Maxwellton, Bart.	1828
LAUDER, Sir Thomas Dick, of Fountainhall, Bart.	1827
LAMB, Sir Charles, of Beauport, Bart.	1836
LOCKHART, Sir Norman Macdonald, of Lee and Carnwath, Bart.	1832
LEES, Sir Edward S., Secretary to the General Post-Office for Scotland	1832
LEITH, Major-General Sir Alexander, of Freefield, K.C.B.	1811
LINDSAY, Lieut.-Colonel Sir Martin, 78th Regiment	1816
L'Amy, James, of Dunkenny, Sheriff of Forfarshire	1806
Laidlaw, Robert, at Netherorsock	1833
Laing, Rev. Francis, of Carselogie	1824
Laird, David, of Strathmartin	1833
Lamond, James, of Stranduff	1827
Lamont, Alexander, of Knockdow	1819

	Admitted
Lamont, Archibald James, of Lamont	1840
Lamont, Robert, Writer in Glasgow	1838
Lang, Alexander, of Overton	1801
Laurie, Robert, Merchant, Leith	1834
Law, Robert, Engineer, Shettlestone	1838
Lawson, Alexander, Merchant, Dundee	1843
Lawson, Charles, Seedsman and Conservator of the Museum of the Society	1830
Lawson, John, younger of Chapelton	1832
Leadbetter, John, Merchant, Glasgow	1838
Learmonth, John, of Dean	1814
Learmonth, Thomas, formerly of Lawrence Park	1824
Ledingham, Robert, Advocate, Aberdeen	1840
Legh, Rev. Peter, Golborne Park, Lancashire	1823
Leighton, William, Factor to the Duke of Hamilton	1831
Leitch, James, Merchant, Greenock	1831
Leith, Alexander, younger of Freefield	1841
Lennie, William, of Ballochneck	1836
Lennox, John L. Kincaid, of Kincaid	1824
Leslie, Angus, Prinsinain	1830
Leslie, George A. Young, of Kininvie	1840
Leslie, H. G. of Dunlugas	1826
Leslie, William, of Warthill	1826
Leny, James Macalpine, of Dalswinton	1824
Liddel, Andrew, Merchant, Glasgow	1839
Liddell, James, Auchtertool House	1843
Limond, David, of Dalblair	1832
Lindsay, Alexander K., of Balmungo	1841
Lindsay, Donald, Accountant, Edinburgh	1843
Lindsay, Lieut.-Col. James, of Balcarras	1823
Lindsay, John, Corn-Merchant, Dundee	1826
Lizars, William Home, Regent Terrace, Edinburgh	1835
Loch, James, of Kirktomy, M.P.	1822
Lockhart, Alexander Macdonald, Carnwath	1835
Lockhart, Allan Elliot, of Borthwickbrae	1832
Lockhart, Norman, of Tarbrax	1815
Lockhart, William, of Milton Lockhart, M.P.	1836
Logan, Alexander, London	1831
Logan, George, W.S., Principal Clerk of Teinds	1844
Logan, Robert, of Corramore, Surgeon, New Lanark	1844
Longmore, John Alexander, W.S.	1837
Lorimer, James, of Kellyfield, Factor to the Earl of Kinnoul	1826
Lorimer, Thomas Webster, Aberdalgie, Perth	1843
Louson, David, Town-Clerk of Arbroath	1813
Low, Alexander, Accountant, Edinburgh	1830

	Admitted
Low, David, of Laws, Professor of Agriculture in the University of Edinburgh	1825
Low, James, Berrywell	1843
Low, Colonel John, C.B., Madras Army	1844
Low, Lieut.-Col. Robert, Bengal Army	1841
Lumsdaine, the Rev. Edwin Sandys, of Blanerne and Inergelly	1837
Lumsdaine, James, of Lathallan	1833
Lumsden, Benjamin, of Kingsford	1828
Lumsden, Henry, of Auchindoir	1830
Lumsden, Hugh, of Pitcaple, Sheriff of Sutherlandshire	1825
Lumsden, James, Braco, Banffshire	1840
Lumsden, James, Junior, 121, Bath Street, Glasgow	1844
Lumsden, William-James, of Balmedie	1841
Lyall, Robert, Factor to Sir J. Carnegy of Southesk, Bart.	1826
Lyall, Robert, of Lauriston	1843
Lyell, Thomas, R.N., Kinnordy	1836
Lyon, George, of Glenogle	1809
Lyon, John, High School, Leith	1824
Lyon, John Stewart, of Kirkmichael	1837

M

*MONTROSE, His Grace James, Duke of, President of the Society	1821
MARCH, Right Hon. Charles, Earl of	1840
†MORTON, The Right Hon. George Sholto, Earl of	1828
†MORAY, The Right Hon. Francis, Earl of, K.T.	1793
†MANSFIELD, The Right Hon. David, Earl of	1833
MANSFIELD, The Right Hon. the Dowager Countess of	1840
MINTO, The Right Hon. Gilbert, Earl of, G.C.B.	1808
†MELVILLE, The Right Hon. Robert, Viscount, K.T.	1798
MACDONALD, The Right Hon. Godfrey William Wentworth, Lord	1833
MONTAGU, The Right Hon. Henry James, Lord	1801
MURRAY, General the Right Hon. Sir George, G.C.B.	1826
MAITLAND, Captain the Hon. Sir Anthony, R.N.	1831
MAULE, The Right Hon. Fox, younger of Panmure, M.P.	1831
MACKENZIE, The Right Hon. Holt	1833
MACAULAY, The Right Hon. T. B., M.P.	1839
MACNEILL, Right Hon. Duncan, Lord Advocate for Scotland	1833
MACDONALD, The Hon. Archibald	1796
MURRAY, The Hon. David, Scots Fusileer Guards	1840
MACKENZIE, The Hon. Mrs. Stewart of Seaforth	1816
MACKENZIE, The Hon. Lord	1803
MEDWYN, The Hon. Lord	1802
MONCREIFF, The Hon. Lord	1830
MURRAY, The Hon. Lord	1823

	Admitted
MELVILLE, The Hon. William Leslie	1833
MORETON, The Hon. Augustus Henry Macdonald, of Largie	1844
MAXWELL, Sir W. A. of Calderwood, Bart.	1830
MENZIES, Sir Robert, of Menzies, Bart.	1841
MENZIES, The Hon. Lady of Menzies	1839
MURRAY, Sir William Keith, of Ochtertyre, Bart.	1830
MAXWELL, Sir John, of Pollock, Bart.	1825
MAXWELL, Sir William, of Monreith, Bart.	1840
MONCREIFF, Sir Thomas, of Moncreiff, Bart.	1843
MACKENZIE, Sir James John Randall, of Scatwell, Bart.	1838
MACKENZIE, Right Hon. Lady Anne, of Scatwell	1841
MACGREGOR, Sir John Atholl Bannatyne, of Macgregor, Bart.	1832
MONTGOMERY, Sir Graham, of Stanhope, Bart.	1843
MAXWELL, Sir David, of Cardoness, Bart.	1810
MACKENZIE, Sir John M. of Delvin, Bart.	1829
MENTEATH, Sir Charles Grenville Stuart, of Closeburnhall, Bart.	1803
MANSEL, Sir John, Bart., Comrie House	1840
MACTAGGART, Sir John, of Ardwell, Bart., M.P.	1839
MILNE, Admiral Sir David, of Milnegraden, K.C.B.	1808
MACDONELL, General Sir James, K.C.B., Coldstream Guards	1803
MACLEOD, Major-General Sir John, of Unish	1804
MUNRO, Sir George Gun of Poyntzfield	1837
Macadam, John, of Blairover	1824
Macalister, Alexander, of Loup and Torrisdale	1840
Macalister, Charles S., of Kennox	1806
Macalister, Major James, of Springbank, late 13th Dragoons	1807
Macalister, Keith Macdonald, of Inistrynish	1829
Macalister, Keith, of Glenbarr	1842
Macallan, James, W.S.	1823
Macarthur, Alexander, Banker, Inverary	1845
Macarthur, Major Alexander, H.E.I.C.S.	1840
Macarthur, Duncan, Dunollybeg	1842
Macarthur, Dr. Peter, of Delnies	1819
Macaskill, Donald, of Rhudunan	1840
Macaskill, Donald, Claggan	1841
Macaskill, Hugh, of Tallisker	1830
Macaslin, Alex., Nursery and Seed Merchant, Glasgow	1838
Macbean, Æneas, W.S.	1812
Macbean, Duncan, of Tomatin, Merchant, Glasgow	1828
Macbean, Lieut.-Colonel James, late 78th Regiment	1806
Macbride, James, Merchant, Greenock	1844
Machray, Isaac, Torry Farm, near Aberdeen	1841
M'Call, James, of Daldowie	1844
MacCall, Thomas, of Craighead	1838

	Admitted
MacCallum, George Kellie, Charlton House	1842
MacCallum, John, Plewlands	1843
MacCheyne, Adam, W.S.	1819
MacClelland, George, W.S.	1838
MacColl, Donald, Appin House	1843
MacConnell, Archibald, Merchant, Glasgow	1845
MacConnell, John, Penrith	1842
Maconochie, Alexander, of Meadowbank	1800
Maconochie, Allan, yr. of Meadowbank	1842
MacCorquodale, Hugh, 10, St. John Street, Edinburgh	1803
MacCulloch, John, of Barholm	1810
Macdiarmid, John, Dumfries	1827
Macdonald, Alexander, of Lochshiel	1824
Macdonald, Major-General Alex., Royal Horse Artillery	1810
Macdonald, Dr. Alexander, Royal Artillery, Prince Edward's Island	1838
Macdonald, Alexander, Beauly, Factor for Lord Lovat	1841
Macdonald, Alaster M'Ian, younger of Dalchoisnie	1841
Macdonald, Alexander, Broadford, Skye	1840
Macdonald, Captain Angus, of Milltoun	1798
Macdonald, Angus, of Glenaladale	1827
Macdonald, Archibald, Islay, son of the Honourable Archibald Macdonald	1838
Macdonald, Lieut.-Colonel D. Robertson, of Kinlochmodart	1805
Macdonald, Major Donald, of Ardmore	1822
Macdonald, Captain Donald, of Isauld, Royal Engineers	1817
Macdonald, Donald, of Craigruie	1829
Macdonald, Donald, of Lochinver	1834
Macdonald, Hugh P., of Mugstad	1830
Macdonald, James, of Dalness, Sheriff-Substitute, Edinburgh	1822
Macdonald, James Thomas, of Balranald	1832
Macdonald, Colonel John, of Dalchoisnie, 92d Regiment	1819
Macdonald, John, Procurator-Fiscal, Dunfermline	1836
Macdonald, John Robertson, Rodil, Harris	1841
Macdonald, Matthew Norman, W.S.	1818
Macdonald, Ranald, of Bornish	1806
Macdonald, Reginald George, of Clanranald	1807
Macdonald, Lieut.-Col. Robert, of Inchkenneth, C.B.	1814
Macdonald, Roderick C., of Castle Teirim, Paymaster, 30th Regiment	1839
Macdonald, Thomas, Fort-William	1827
Macdonald, Lieut.-Colonel William, of Calley	1813
Macdonald, William, Ballishare, M.D.	1818
Macdonald, William, Abbotsford Place, Glasgow	1844
Macdonald, William Bell, of Rammerscales	1841

	Admitted
Macdonald, William Farquharson, of St. Martins and Garth	1844
Macdonell, Alexander, W.S., and Sheriff-Substitute of Wightonshire	1832
Macdonell, Æneas Ronaldson, of Glengary	1839
Macdonell, Lieut.-Colonel George, C.B.	1833
Macdoual, Lieut.-Colonel C. B., Stranraer	1824
Macdouall, James, of Logan	1838
Macdougall, Allan, W.S.	1829
Macdougal, Colin, of Lunga	1808
Macdougal, Dugald, of Gallanach	1814
Macdougall, Captain James Patrick, late Honourable East India Company's service	1838
Macdougal, Major Patrick, of Soroba	1800
Macdougall, John, of Macdougall, Captain R.N.	1821
Macdowall, Henry, Clippings, Renfrewshire	1845
Macdowall, William of Barr	1838
Macduff, Alexander, of Bonhard, W.S.	1843
Macduff, Captain Alexander, Factor for Lord Glenlyon	1839
Maceachern, Captain Colin, of Oatfield	1825
Macewan, James, of Tarr of Ruskie	1834
M'Ewan, John, Merchant, Inverness	1839
Macfarlane, Alexander, of Thornhill	1825
Macfarlane, John, of Muckroy	1821
Macfarlane, John Fletcher, Surgeon, Edinburgh	1823
Macfarlan, The Rev. Dr. Patrick, Greenock	1839
Macfarlane, Thomas, Clachan	1829
Macfarlane, William of Bencleich, Luggiebank	1832
Macfie, Dugald, of Gerhallow Lodge	1843
Macfie, John, Regent Terrace, Edinburgh	1823
Macfie, William, yr. of Langhouse, Merchant, Greenock	1826
Macgibbon, Alexander, of Crawhill	1835
Macgillivray, John L., of Dumnaglass	1838
Macgregor, Alexander, of Garscadden	1837
Macgregor, Alexander, Jun., Glasgow	1823
Macgregor, Lieut.-Col. Hugh, late 91st Regiment	1814
Macgregor, The Rev. Gregor, Minister of Lismore and Appin	1840
Macgregor, Robert, Tacksman of Delavorar	1839
Macgregor, James, Fort-William	1833
Macgregor, John, of Glengyle	1832
Macgregor, Lieut.-General Murray, Bengal Cavalry	1801
Mackie, John, of Bargaly, Convener of the Stewartry of Kirkcudbright	1844
Macilwraith, James, of Auchenflower	1835
Mackinlay, David, Oswald Bank, Partick	1844
Macinnes, James, S.S.C.	1812
Macinnes, John, at Dandaleith	1822

	Admitted
Macinroy, James Patrick, of Lude	1831
Mackintyre, John, Cleugh Farm, Oban	1844
Mackinroy, William, of Shierglas	1827
Mackintosh, Alexander, of Mackintosh	1833
Mackintosh, Colonel Alexander, of Farr	1839
Mackintosh, Angus, of Holm	1844
Mackintosh, Æneas, yr. of Mackintosh	1839
Mackintosh, Æneas W., yr. of Raigmore	1844
Mackintosh, George, yr. of Campsie and Dunchattan	1838
Mackintosh, William, of Geddes and Hilton	1816
Mackintosh, George, yr. of Geddes and Hilton	1832
Macintosh, William, of Millbank	1813
Macintosh, Donald, Edinburgh	1816
Macintosh, Lachlan, of Raigmore	1814
Macivor, John, of Ardmarnock	1827
Mackay, Charles, jeweller, North Bridge Street, Edinburgh	1839
Mackay, James, Goldsmith, Edinburgh, the Society's Goldsmith and Jeweller	1804
Mackay, John, Banker, Inverness	1837
Mackay, Thomas George, W.S., Factor on the Estate of Moncrieff	1837
Mackay, Colonel William, of Bellfield	1839
Mackellar, Rev. Dr. Angus, Edinburgh	1818
Mackellar, Duncan, late of Australia, Inverleith Row, Edinburgh	1839
Mackenzie, Alexander, Sheriff-Substitute of Ross-shire	1805
Mackenzie, Alexander, Writer, Perth	1829
Mackenzie, Daniel, Junior, Merchant, Glasgow	1844
Mackenzie, George Falconer, of Allangrange	1819
Mackenzie, George Ross, of Aldie	1819
Mackenzie, George, Dingwall	1830
Mackenzie, Murdo, late of Calcutta, Stornoway	1839
Mackenzie, James, W.S.	1845
Mackenzie, James William, Banff	1825
Mackenzie, John, of Glack	1835
Mackenzie, John, Ness House, Inverness	1809
Mackenzie, John, Writer, Edinburgh	1813
Mackenzie, John, Writer, Tain	1835
Mackenzie, John Hay, of Cromartie	1822
Mackenzie, John Whiteford, W.S.	1821
Mackenzie, Kenneth Francis, formerly of Park Place, Edinburgh	1811
Mackenzie, Murdo, at Dundonnell	1799
Mackenzie, Richard, of Dolphinton, Deputy-Keeper of the Signet	1809
Mackenzie, Robert Duncanson, of Culdarran	1838

	Admitted
Mackenzie, Sutherland, late Manager of the Scottish Union Insurance Company	1808
Mackenzie, Thomas, of Applecross, M.P.	1816
Mackenzie, Dr. William, of Culbo, Edinburgh	1810
Mackenzie, William, of Muirton	1803
Mackenzie, William Forbes, of Portmore, M.P.	1831
Mackerrel, Henry, of Hillhouse	1837
Mackilligan, William, of Relugas	1837
Mackinlay, John, Rothesay	1818
Mackinnon, Alexander Kenneth, of Corry	1827
Mackinnon, Dr. Farquhar, of Kyle	1819
Mackinnon, Rev. John, Minister of Slate	1815
Mackinnon, Neil, of Demerara	1819
Mackinnon, William Alexander, of Mackinnon, M.P.	1811
Mackintosh, Charles, of Aberarder	1831
Mackintosh, John, Manufacturer, Inverness	1839
M'Knight, Robert, of Barlochan	1841
Maclachlan, Colin, Laudle	1836
Maclachlan, Dugald, Fort-William	1832
Maclachlan, Dugald, of Killimore	1838
Maclachlan, Eun, Liddesdale	1836
Maclachlan, George, W.S.	1843
Maclachlan, Peter, Bank Agent, Pulteneytown	1839
Maclachlan, Robert of Maclachlan	1817
Maclaine, John, of Killundine	1822
Maclaine, Major Lachlan, late Royal Regiment	1836
Maclaine, Murdoch of Lochbuy	1835
Maclaren, Major, Portobello, late Madras Army	1844
Maclaren, Charles, Edinburgh	1833
Maclaren, Donald, of Dullatur, Callander	1832
Maclaren, Duncan, Cambuserricht	1834
Maclaren, James, Gavel House, Kilsyth	1832
Maclaren, John, of Balmeannoch, residing at Crathie Cottage	1839
Maclean, Colonel Alexander, of Ardgower	1793
Maclean, Alexander, of Carsaig	1835
Maclean, Lieutenant-Colonel Allan Thomas, 13th Light Dragoons	1835
Maclean, Archibald, D., Navy Pay-Office, London	1837
Maclean, Colin, of Laggan, Islay	1838
Maclean, Donald, of Boreray	1822
Maclean, Donald, of Kinloch, W.S.	1793
Maclean, Hugh, of Coll	1819
Maclean, Hugh, late of Jamaica, residing at Brighton	1827
Maclean, Dr. Lachlan, Tobermory	1823
Maclean, Neil, Land-Surveyor, Inverness	1837

	Admitted
Maclean, James, Braidwood, Penicuik	1841
Maclean, William, of Plantation, Glasgow	1838
Maclean, William, Commander R.N., Ardgower	1840
Macleay, Kenneth, of Newmore	1839
Macleish, Adam, Merchant, Greenock	1831
Maclelland, Thomas, Banker, Ayr	1836
Macleod, Alexander, Surgeon, Uist	1829
Macleod, Alexander, of Canada	1811
Macleod, Alexander Norman, late of Harris	1817
Macleod, Donald, at Gledfield	1830
Macleod, Norman, of Macleod	1839
Macleod, Dowager Mrs. of Macleod	1816
Macleod, Norman, of Dalvey	1839
Macleod, Martin, of Drynoch	1831
Macleod, Roderick, of Cadboll	1807
Macleod, Colonel W., H.E.I.C.S.	1817
Maclellan, John, Merchant, Greenock	1831
Maclennan, Duncan, Solicitor, Inverness	1840
Maclennan, John, of Lyndale	1840
Macmickan, James Clark, of Corbieton	1841
Macmillan, Donald, of Lephenstrath	1825
Macmillan, Captain Iver, late of the Valentine Indiaman	1798
Macmillan, James, of Lawloch	1834
Macmillan, Peter L., of Barwhinnock	1844
Macnab, Archibald, of Macnab	1806
Macnab, Gilbert, Sheriff-clerk Depute, Ayr	1836
Macnabb, James Monro, late of Arthurstone	1837
Macnair, James, of Balvie	1838
Macneale, George, of Ugadale	1825
Macneill, Captain Alexander, younger of Colonsay	1835
Macneill, Lieut.-Col. Donald, late 91st Regiment	1802
Macneill, John, late of Oakfield	1796
Macneill, Colonel Roderick, Barra	1817
Macneel, Alexander, Collector of Customs, Stranraer	1829
Macneill, Alexander, Advocate	1835
Macneill, Malcolm, Lossit, Islay	1835
M'Neill, Malcolm Macmillan, younger of Carskey	1839
Macnicol, John, Factor for the Earl of Airlie	1831
Macnicol, Nicol, Lieut. Half-pay, H.M., 27th Regiment	1836
Macombie, James Boyn, of Gillybrands, Advocate, Aberdeen	1840
Macombie, William, of Linturk and Easter Skene	1840
Macpherson, Lieut. Alexander, Ruthven, Kingussie	1839
Macpherson, Alexander, M.D., Garbity	1841
Macpherson, Allen, 2, Harley Place, New Road, London	1822
Macpherson, Captain Æneas, Nuidmore, Kingussie	1839

	Admitted
Macpherson, Col. D., Strathmashie, Kingussie	1839
Macpherson, Major-General Duncan, Hon. East India Company's Service	1825
Macpherson, Lieut.-Colonel Duncan, Adersier, late 78th Regiment	1840
Macpherson, Captain Duncan, Collector of Customs at Inverness	1839
Macpherson, Duncan, Postmaster, Kingussie	1841
Macpherson, Major Evan, of Glentruim	1832
Macpherson, Ewan, of Cluny Macpherson	1827
Macpherson, George Gordon, Surgeon, H.E.I.C.S.	1841
Macpherson, Hugh, of Eigg, M.D., one of the Professors of King's College, Aberdeen	1828
Macpherson, John, Beauly	1809
Macpherson, Kenneth, late Member of the Hon. House of Assembly, Jamaica	1826
Macpherson, Captain Lachlan, Ballidmore, Kingussie	1839
Macpherson, William, of Blairgowrie	1822
Macquarie, Lachlan, of Glenfersa	1835
Macqueen, John, Auchenhay	1841
Macqueen, Robert, of Braxfield	1842
Macqueen, Captain Simon, Corrybrough	1820
Macrae, Alexander, Askernish	1832
Macrae, Archibald, M.D., Bruiach, Inverness-shire	1839
Macrae, Colin, of Demerara	1823
Macrae, Rev. Finlay, Minister of North Uist	1841
Macreadie, Patrick Boyle Muir, of Pierstone	1838
Macritchie, Charles Elder, Edinburgh	1831
Macritchie, Thomas, Merchant, Leith	1805
Macritchie, Thomas Elder, of Craigton, W.S.	1831
Mactaggart, Captain J. O., late Hon. East India Company's Marine Service, Ayr	1835
Mactavish, Alexander, Solicitor, Inverness	1839
Mactavish, Duncan, Garthbeg	1840
Mactier, Anthony, of Durris	1834
Macturk, Robert, of Hastingshall	1826
Macvicar, John, of Ardarroch	1842
Macvicar, Rev. J. G., Madras	1828
Macwilliam, George, Land Surveyor and Farmer at Sheriffston	1841
Madden, Henry R., M.D., Penicuik	1839
Maitland, Thomas, of Dundrennan	1844
Makgill, George, of Kemback	1841
Makins, Edward, Auchincraw Mains, Berwickshire	1841
Malcolm, Neill, of Poltalloch	1830
Malcolm, William E., of Burnfoot	1840
Manford, Robert Alexander, Surgeon, Inverness	1839

	Admitted
Mansfield, Thomas, of Scatwell	1827
Marshall, Claud, Sheriff-substitute of Greenock	1819
Marshall, Henry, Dep. Inspector-General of Hospitals	1833
Marshall, James, Jeweller, Edinburgh	1833
Marshall, James, of West Mains of Callander	1842
Marshall, John, Advocate	1822
Marshall, Walter, Jeweller, Edinburgh	1839
Marshall, Captain William, Rothesay	1845
Marshall, William, Goldsmith, Edinburgh	1843
Martin, George, Civil-Engineer, Glasgow	1839
Martin, William, Factor for Neill Malcolm, Esq., of Poltalloch	1844
Matheson, James, of Achany, Merchant in China	1843
Mathieson, William, Merchant, Glasgow	1838
Mathieson, Gordon Clunes, Tacksman of Culgower, Sutherlandshire	1839
Maule, William, Nelson Street, Edinburgh	1830
Maxton, John, Wine Merchant, Leith	1835
Maxtone, Anthony, of Cultoquhey	1812
Maxwell, Alexander Harley, of Portrack	1834
Maxwell, Francis, of Breoch	1841
Maxwell, Francis, Writer, Glasgow	1844
Maxwell, Henry, Merchant, Leith	1830
Maxwell, Henry Constable, of Milnhead	1838
Maxwell, John, Westwater	1838
Maxwell, John Argyll, late at Aros	1834
Maxwell, John Hall, younger of Dargavel, Advocate	1838
Maxwell, John Heron, younger of Kirrouchtree	1839
Maxwell, Lieut.-Col., of Orchardtown and Gretna	1825
Maxwell, Marmaduke of Terregles	1830
Maxwell, Wellwood, of the Grove	1838
Maxwell, Wellwood, of Munches	1839
Maxwell, William, younger of Cardoness	1841
Maxwell, William, of Carruchan, Chamberlain to the Duke of Buccleuch and Queensberry	1837
Maxwell, William Constable, of Nithsdale and Evringham	1830
May, George, Civil Engineer, Superintendent of the Caledonian Canal	1839
Mayne, Major-General John, Hon. E. India Comp. Service, C.B.	1813
Mayne, Robert, 42, Melville Street, Edinburgh	1838
Meason, Magnus Gilbert Laing, of Ballinshoe	1836
Meiklejohn, Rev. Robert, Minister of Strathdon	1840
Meek, George, of Campfield	1814
Megget, Thomas, W.S.	1811
Meiklam, James, of Cairnbroe	1831
Mein, Robert, Sunlawshill	1838

	Admitted
Meldrum, Alexander, of Easter Kincaple	1841
Melville, John White, of Mount Melville	1819
Menteath, James Stewart, younger of Closeburn Hall	1837
Menzies, Major Archibald, late of the 42d Royal Highland Regiment	1817
Menzies, Fletcher Norton, Castle Menzies	1841
Menzies, George Cumming, of Knockintober	1837
Menzies, James, of Pitnacree	1834
Menzies, John of Chesthill	1821
Menzies, Ranald, of Culdares	1842
Menzies, Robert, Land-surveyor, Dunkeld,	1829
Mercer, George, of Gorthy	1822
Mercer, Dr James, F.R.C.S.E., Lecturer on Anatomy, &c., Edinburgh	1844
Merricks, James, Gunpowder Manufacturer, Roslin	1841
Merry, James, junior, Coalmaster, Glasgow	1838
Middleton, Charles Stuart, Merchant, Liverpool	1840
Mill, James, Surgeon, Wick, Joint-Tacksman of Luggate, Haddingtonshire	1839
Mill, John, Merchant, Edinburgh	1814
Millar, Andrew, Merchant, Edinburgh	1827
Millar, John, of Ballumbie	1834
Millar, William, Writer, Wick	1839
Miller, Alexander Penrose, 92d Highlanders	1843
Miller, Charles Hagart, late of Pleasanthill, W.S.	1834
Miller, George, of Frankfield	1814
Miller, O. G., Writer, Dundee	1843
Miller, Patrick, of Forrest	1806
Miller, William, younger of Glenlee, 12th Royal Lancers	1837
Miller, William, of Monkcastle, Advocate	1828
Miln, James, of Woodhill	1837
Milne, Alexander, of Gartferry	1844
Milne, David, younger of Milnegraden, Advocate	1835
Milne, Nicol, of Faldenside, Advocate	1841
Mitchell, Alexander, Civil Engineer, Perth	1838
Mitchell, Colonel James, late of the 92d Regiment	1821
Mitchell, John, Merchant, Glasgow, late Chief Magistrate of Gorbals	1838
Mitchell, John, junior, Merchant, Leith	1832
Mitchell, John, of Bellfield	1836
Mitchell, John, Inverscaddle, Ardgour,	1843
Mitchell, Joseph Civil Engineer, Inverness, and Superintendent of the Parliamentary Roads in Scotland	1836
Mitchell, Patrick, residing at Enzean, Monymusk	1831
Mitchelson, Arch. Hepburne, late of Middleton	1832
Moir, Benjamin, Merchant, Aberdeen	1840
Moir, Charles Alexander, of Leckie	1814

	Admitted
Moir, John, Printer, Edinburgh	1804
Moir, John Macarthur, of Hillfoot and Milton	1834
Moncrieff, Alexander, W.S., Perth	1842
Moncrieff, Robert Scott, younger of Fossaway	1831
Moncrieff, Robert Hope, Perth	1807
Monro, Dr. Alexander, Professor of Anatomy in the University of Edinburgh	1807
Monro, Alexander, younger of Craiglockhart, Rifle Brigade	1835
Monro, Alexander Binning, of Auchenbowie	1833
Monro, Donald, of Latheron, Caithness	1839
Monteath, James, Merchant, Glasgow	1838
Monteith, Henry, of Carstairs	1808
Monteith, Robert, younger of Carstairs	1837
Montgomerie, Major H. A., of Arndean	1841
Montgomery, Alexander, Captain, R.N.	1834
Montgomery, Robert, Stanhope, Atholl Crescent	1829
Montgomery, William, of Belmont	1836
Monnypenny, David, of Pitmilly	1804
Moore, James Carrick, of Corsewall	1829
Moore, John Carrick, younger of Corsewall	1839
More, John Shank, Advocate, Professor of Scots Law in the University of Edinburgh	1816
Moreland, Charles, Banker, Stranraer	1827
Morgan, James, Solicitor in the Supreme Courts	1841
Morison, Alexander, of Bognie and Mountblairy	1840
Morison, Major-General William, C.B., M.P.	1842
Morrieson, Robert, H.E.I.C.S., Edinburgh	1833
Morrison, Alexander, Writer, Glasgow	1838
Morrison, A. G., Sallachan, Ardgour	1843
Morton, Robert, late Jeweller, Edinburgh	1812
Morton, Hugh, Writer, Glasgow	1844
Morton, Hugh, Engineer, Leith Walk	1835
Mouat, William Cameron, of Garth, Captain, H.P., 13th Light Dragoons	1838
Mouat, William Cameron, younger of Garth	1830
Moubray, James, of Cambus	1838
Moubray, John Marshall, of Hartwood, W.S.	1843
Mudie, John, younger of Pitmuies, Advocate, Edinburgh	1840
Muir, Andrew, Merchant, Greenock	1826
Muir, James, Merchant, Greenock	1827
Muir, John, of Gartferry	1843
Muir, Malcolm, Timber-merchant, Glasgow	1838
Muirhead, Claud, publisher of the Edinburgh Advertiser	1820
Muirhead, James, Jeweller, Glasgow	1844
Munro, Colin, Dingwall	1841
Munro, Hugh, of Teaninich	1799
Munro, Hugh Andrew Johnston, of Novar	1832
Munro, Alexander, Princes Street, Edinburgh	1810

	Admitted
Munro, Thomas M., Bengal Medical Establishment, Wooden	1843
Murdoch, John Burn, of Gartincaber	1820
Murdoch, John, Factor for Colonel Hunter Blair of Dunsky	1836
Murdoch, Peter, late of Van Diemen's Land, now in Ayrshire	1839
Mure, James O. Lockhart, of Livingstone	1828
Mure, William, Factor to the Earl of Selkirk	1841
Mure, William, of Caldwell	1840
Murray, Alexander, of Broughton, M.P.	1822
Murray, Andrew, of Murrayshall, Sheriff of Aberdeenshire	1804
Murray, Anthony, of Dolline, W.S.	1828
Murray, James, of the Monkland Iron-Works	1828
Murray, James, of Craigend	1840
Murray, James, Garnkirk, Lanarkshire	1844
Murray, James Thomas, W.S.	1840
Murray, John, 24, Ainslie Place, Edinburgh	1837
Murray, John Dalrymple, of Murraythwaite	1825
Murray, John, Meikleourhouse, Blairgowrie	1840
Murray, John, younger of Murrayshall, Advocate	1842
Murray, Captain Jack, R.N.	1843
Murray, Joseph, of Ayton	1820
Murray, Patrick, of Simprim	1794
Murray, Captain Samuel Hood, of H.M. 67th Regiment, Plymouth	1834
Murray, William, of Polmaise	1806
Murray, William, 182, Atholl Place, Glasgow	1827
Murray, William, of Henderland	1826
Mutrie, David, Merchant, Glasgow	1804
Mylne, William, Bolton, Haddington	1841

N

Northumberland, His Grace Hugh, Duke of, K.G.	1842
Northesk, Right Hon. William, Earl of	1843
Napier, Right Hon. Francis, Lord	1843
Napier, Sir William Milliken of Milliken, Bart.	1820
Nasmyth, Sir John Murray, of Posso, Baronet	1838
Nicholson, Sir Arthur, of Lochend, Bart.	1812
Nairn, David, of Drumkilbo and Drumfin	1826
Nairne, James Mellis Drummond, of Dunsinane	1821
Nairne, James, of Claremont	1829
Napier, George, Advocate, Sheriff of Peebles-shire	1840
Napier, Robert, of Lancefield	1844
Napier, Robert Dunmore, of Ballekinrain	1824
Napier, William, Factor for Gartmore	1843
Napier, William, late of Blackstone	1815
Nasmyth, Robert, 78, George Street, Edinburgh	1839
Neil, Lieut.-Colonel William, of Barnweill	1824

	Admitted
Neill, Patrick, LL.D., Secretary Caledonian Horticultural Society	1808
Neilson, Robert, of Hilton	1831
Newbigging, John Stewart, W.S.	1836
Newton, James, Merchant, Leith	1838
Newton, Robert Pillans, Factor for Lord Frederick Gordon Hallyburton	1837
Nicholson, Major Allan Macdonald, of Ardmore	1819
Nicol, John Inglis, M.D., Inverness	1839
Nicol, James, Milden, Advocate, Aberdeen	1840
Nicoll, Alexander, Solicitor, Glasgow	1844
Nicoll, James, of Ballmyle	1843
Nielson, Andrew, Bank of Scotland, Dundee	1843
Niven, William, of Achalton and Kirkbride	1812
Noble, John, 90, Gloucester Place, London	1838
Noble, William, 152, Fleet Street, London	1838

O

OGILVY, The Honourable William, of Airlie	1823
OGILVY, The Honourable Donald, of Clova	1824
OGILVY, Sir John, of Inverquharity, Bart.	1824
ORDE, Sir John Poullet, of Kilmory, Bart.	1830
Ogden, John Biss, Harrietfield	1841
Ogilvie, David William Balfour, Burnside	1842
Ogilvie, Captain William, R.N.	1820
Ogilvie, William, of Chesters, Advocate	1809
Ogilvy, Charles, of Seafield, Zetland	1838
Ogilvy, John, of Inshewan	1836
Ogilvy, John, of Quarff, Zetland,	1838
Ogilvy, Peter Wedderburn, of Ruthven	1826
Ogilvy, Thomas, yr. of Ruthven, 2d Life Guards	1844
Ogilvy, Thomas, of Corrimony and Lakefield	1838
Ogston, Alexander, of Ardo	1840
Oliphant, Charles, W.S.	1813
Oliphant, Laurence, of Condie	1828
Oliphant, James, of Gask	1828
Oliphant, Robert, younger of Rossie	1840
Oliver, Robert Stephen, Merchant, Edinburgh	1842
Ord, John, younger of Muirhouselaw	1841
Orr, Andrew, of Glenfield	1844
Orr, Charles James Fox, of Thornly Park, W.S.	1816
Orr, Patrick, W.S.	1825
Oswald, James, of Auchincruive, M.P.	1829
Oswald, Colonel Robert, Dunnikier	1824

P

POLWARTH, The Right Hon. Henry Francis H., Lord	1829

	Admitted
† Panmure, The Right Hon. William, Lord	1805
Pringle, Sir John, of Stitchell, Bart.	1810
Parish, Sir Woodbine, late Chairman of the Board of Excise	1819
Parkes, Samuel, London	1817
Paterson, Campbell, Banker, Oban	1844
Paterson, George, of Castle Huntly	1804
Paterson, George, younger of Castle Huntly	1841
Paterson, John, Factor to the Duke of Hamilton in Arran	1826
Paterson, John, residing at Borlum	1832
Paterson, Henry, Manager of the North of Scotland Bank	1839
Paterson, Robert, of Brocklehirst	1835
Patison, John, W.S.	1806
Patton, George, of Cairnies, Advocate	1843
Paton, John, of Crailing	1833
Paton, John, of Grandholm	1841
Patrick, Captain James, of Drumbowie	1836
Patrick, William, of Roughwood, W.S.	1805
Patterson, Alexander, Wine Merchant, Leith	1840
Patton, James Murray, of Glenalmond	1830
Paul, Henry, Banker, Glasgow	1830
Paul, William, Accountant, Edinburgh	1829
Paul, the Rev. John, one of the Ministers of St Cuthbert's Edinburgh	1839
Pearson, Alexander, W.S.	1819
Peddie, William, Writer, Perth	1828
Peebles, Charles, Glasgow	1839
Pender, Thomas, Comptroller-General of Stamps and Taxes	1839
Pennycuick, John, of Soilarie, late Major 47th Regiment	1823
Penny, William, Advocate	1844
Peter, John, Dundee	1828
Philip, Robert, Merchant, Leith	1844
Phillip John, Distiller, Leith	1828
Pillans, James, Regent Terrace	1799
Piper, Edward, Edinburgh	1833
Pitcairn, John, of Pitcairns	1815
Pitcairn, John, junior, of Pratis	1841
Playfair, William Henry, Architect, Edinburgh	1824
Plummer, Charles, of Sunderlandhall	1842
Pollexfen, James R., W.S.	1841
Pollock, Arthur, Merchant, Grangemouth	1815
Pollock, John, Merchant, Glasgow	1838
Pollock, William, of Barniehill, M.D.	1833
Pollok, Allan, junior of Broomhouse	1844
Popham, Strachan Irvine, Ardchattan Priory, Bonaw	1843
Pringle, Alexander, of Whytbank, M.P.	1821
Pringle, Major David, of Carriber	1842

	Admitted
Pringle, Captain James, R.N., of Torwoodlee	1820
Proctor, William D., of Halkerton	1829
Purves, James, Farmer at Thurdistoft, Caithness	1839
Purves, John, younger of Kinaldie	1844

Q

†QUEENSBERRY, The Most Noble John, Marquis of	1825

R

*RICHMOND and LENNOX, His Grace Charles, Duke of, K.G.	1836
†ROXBURGHE, His Grace James Henry Robert, Duke of, K.T.	1837
†ROSEBERY, The Right Honourable Archibald John, Earl of	1806
ROSSLYN, the Right Hon. James Alexander, Earl of	1835
RANFURLY, The Right Hon. Thomas, Earl of	1808
REIDHAVEN, The Right Hon. John Charles, Viscount	1842
RUTHVEN, The Right Honourable James, Lord	1810
ROBERTSON, The Honourable Lord,	1816
ROLLO, The Honourable William, Master of Rollo	1838
RAMSAY, Sir James, of Banff, Bart.	1823
RIDDELL, Sir James Milles, of Ardnamurchan and Sunart, Bart.	1808
RAMSAY, Sir Alexander, of Balmain, Bart.	1813
RADCLIFFE, Sir Joseph, Bart. of Millsbridge, Yorkshire	1820
RICHARDSON, Sir John Stewart, of Pitfour, Bart.	1823
RUSSELL, Major-General Sir James, of Ashiesteil, K.C.B.	1832
ROSE, Major-General Sir John, of Holm, K.C.B.	1831
Railton, Edward, Oakfield, Glasgow	1839
Rait, D. C., Goldsmith, Glasgow	1838
Ralston, Adam, Kilchiren	1841
Ralston, Alexander, Dundriff	1841
Ralston, Robert William, younger of Glenellrig	1840
Ramsay, Alexander, of Demerara	1806
Ramsay, Captain Thomas, Balmain	1828
Ramsay, William Ramsay, of Barnton, M.P.	1831
Ramsay, Robert Balfour Wardlaw, of Whitehill	1841
Ramsay, Professor William, Glasgow	1844
Ramsay, William Burnett, of Banchory Lodge	1841
Ranken, Bryce Macmurdo, Procurator-Fiscal of Orkney	1841
Ranken, George, of Australia, Drumley, Ayrshire	1839
Ranken, Thomas, S.S.C.	1838
Ranken, Patrick, of Mavisbank	1844
Rankine, William, M.D., Roddinghead	1836
Rannie, Thomas, Birdsbank	1842
Rashleigh, William, of Monabilly, Cornwall	1837
Rattray, Robert, W.S.	1805
Rattray, Robert Clerk, of Craighall Rattray	1826

	Admitted
Rattray, Thomas, younger of Brewlands	1834
Reid, Charles G., younger of Grangehill	1844
Reid, Dr. David Boswell, London	1833
Reid, David Ellanreach, Inverness	1840
Reid, Gabriel, of Kilcalmkill	1820
Reid, John, Hareston, Factor on the Estate of Clova	1841
Reid, John, of Annfield	1844
Rennie, Alexander, Solicitor, Inverness	1839
Rennie, Archibald Hill, of Balliliesk	1839
Rennie, Robert Walker, at Inchira, Factor on the Estate of Pitfour	1827
Rennie, William, Banker, Maybole	1836
Renny, William, of Danevale Park, W.S.	1820
Renton, James, of Greystonelees	1841
Renton, John Campbell, of Lamberton	1839
Reoch, James, Provost of Leith	1826
Rhind, Josiah, Provost of Wick	1839
Rhind, Macduff, Advocate	1843
Richardson, James, Wine Merchant, Edinburgh	1833
Richardson, John, W.S.	1842
Richardson, Ralph, Merchant, Edinburgh	1828
Richardson, Robert, Merchant, Edinburgh	1837
Richardson, William, Banker, Lockerbie	1843
Richardson, William, Seed Merchant, Edinburgh	1843
Rickman, Thomas, Architect, Birmingham, F.S.A.	1831
Riddel, Campbell D., Advocate	1816
Riddell, Charles, of Muselee	1831
Riddell, John, Advocate	1817
Rigg, J. Home, of Morton and Downfield	1824
Ritchie, Robert, Engineer, Edinburgh	1833
Ritchie, Thomas, Bowhouse Farm	1838
Robb, John, of Blackburn, M.D.	1836
Roberton, James, Ladyrig	1841
Robertson, Alexander, W.S.	1825
Robertson, Alexander, Woodside	1842
Robertson, Andrew, Surgeon, Indego	1832
Robertson, Charles, at Buttergask	1836
Robertson, Charles Gordon, Advocate	1842
Robertson, David, of Ladykirk	1842
Robertson, Captain George A., of the Honourable East India Company's Service	1817
Robertson, George, one of the Deputy-Keepers of the General Records of Scotland	1819
Robertson, George, Land Surveyor, Factor on the Estate Fettercairn	1833
Robertson, George Duncan, of Strowan	1839
Robertson, Henry, of Borland	1832

	Admitted
Robertson, James, Factor for the Duke of Argyll	1836
Robertson, James Stewart, of Edradynate	1811
Robertson, James Saunders, W.S.	1816
Robertson, Captain James Walker, R.N.	1823
Robertson, Captain John, late 14th Foot	1825
Robertson, John, Iron Merchant, Glasgow	1844
Robertson, Laurence, Cashier for the Royal Bank, Glasgow	1828
Robertson, Robert, of Auchleeks	1828
Robertson, William, of Kinlochmoidart	1826
Robertson, William, W.S.	1834
Robertson, Alexander Inglis, yr. of Aultnaskiach	1839
Robertson, Arthur John, of Inches	1840
Robertson, Robert, yr. of Auchleeks	1845
Robertson, Stewart, yr. of Derculich	1843
Robertson, William, of Lauchope	1844
Robson, Charles, Lurdenlaw	1841
Rodger, Robert, Merchant, Glasgow	1838
Rogers, George, Kilconquhar Mains	1842
Rolland, Adam, of Gask and Airds	1837
Rose, James, W.S.	1839
Ross, Alexander, Inverleith Row, Edinburgh	1844
Ross, J. B., yr. of Strathgarve	1839
Ross, Major James Kerr, of Lawrence Park	1839
Ross, Lieut.-Colonel Hugh, of Tyndrish	1844
Ross, Hugh, Tacksman of Humberston	1839
Ross, George Clerk, of Culgruff	1840
Ross, John, of Berbice Cottage, Inverness	1839
Ross, John, of Arnage,	1843
Ross, George, of Pitcalnie, Rhives	1839
Ross, Hugh Rose, of Glastullich and Cromarty	1824
Ross, Colonel John Gray, of Strathgarve	1836
Ross, Richard Louthian, of Staffold	1804
Rotch, Thomas Dickson, Drumlanford House, Ayrshire	1845
Rowand, Alexander, yr. of Linthouse	1844
Rowand, Michael, of Linthouse, Banker, Glasgow	1838
Roy, Frederick Lewis, of Nenthorn	1837
Roy, James, jun. Nursery and Seedsman, Aberdeen	1840
Roy, John James, Factor on the estate of Invercauld	1825
Roy, Robert, W.S.	1822
Russell, Claud, Accountant, Auditor of Accounts to the Society	1807
Russell, Francis Whitworth, Bengal Civil Service	1835
Russell, Henry, Merchant, Dunfermline	1836
Russell, James, of Aden	1834
Russell, James, of Blackbraes	1834
Russell, John, one of the Principal Clerks of Session	1806
Russell, Robert, of Dalnair	1834

	Admitted
Rutherford, William Oliver, of Edgertoun and Dinlabyre	1825
Rutherfurd, Andrew, of Lauriston, M.P.	1845

S

*SUTHERLAND, His Grace George Granville, Duke of, K.G.	1813
SUTHERLAND, Her Grace Harriet, Duchess of	1834
SPENCER, The Right Honourable John Charles, Earl, Honorary Member	1837
STRATHMORE, The Right Honourable Thomas, Earl of	1820
†SELKIRK, The Right Honourable Dunbar James, Earl of	1830
STAIR, The Right Honourable John, Earl of	1817
†SEAFIELD, The Right Hon. Francis William, Earl of	1803
STIRLING, The Right Honourable Alexander, Earl of	1825
†STRATHALLAN, The Right Honourable James, Viscount	1811
†SALTOUN, The Right Honourable Alexander George, Lord	1820
SINCLAIR, The Right Honourable Charles, Lord	1829
SCOTT, Right Honourable Lord John	1833
STUART, The Right Honourable Lord James, M.P.	1819
SYLVESTRE, The Baron de, Member of the Institute, Perpetual Secretary of the Royal and Central Society of Agriculture, Paris, Honorary Member	1836
STEVENSON, Andrew, late Minister Plenipotentiary from the United States of America, Honorary Member	1839
STUART, The Honourable Charles	1826
STUART, Lieutenant-General The Honourable Patrick	1833
STUART, The Honourable John	1824
SANDILANDS, The Honourable Robert, of Torphichen	1831
STEUART, Sir Henry M. Seton, of Allanton and Touch, Bart.	1835
SETON, Sir William C., of Pitmedden, Bart.	1834
SINCLAIR, Sir John Gordon, of Stevenston and Murkle, Bart.	1832
SINCLAIR, Sir George, of Ulbster, Bart.	1812
SCOTT, Sir William, of Ancrum, Bart.	1829
STEWART, Sir William Drummond, of Grantully, Bart.	1839
SUTTIE, Sir George Grant, of Balgone and Prestongrange, Bart.	1839
Sadler, Thomas, Norton-Mains, Edinburgh	1838
Salmon, Henry, Banker, Falkirk	1834
Salmond, Robert, Banker, Glasgow	1845
Sandeman, David, of Kirkwood	1831
Sanderson, Captain Archibald, late Royal Regiment, Barjarg House, near Closeburn	1844
Sanderson, George, Merchant, Princes Street	1842
Sanderson, John, Merchant, Dundee	1843
Sandford, Erskine Douglas, Advocate, Steward of the Stewartry of Kirkcudbright	1827
Sandilands, Captain William, of Barneyhill, 7th Dragoon Guards	1838

	Admitted
Sawers, John, of Loanhead, Procurator-Fiscal, Stirlingshire	1834
Sawers, Simon, of Newhouse, Dunbar	1839
Scarth, James, Banker, Leeds	1828
Scarth, Robert, of Scarth	1843
Scales, Andrew, of the Customs, Leith	1828
Scot, William, of Craigmuie	1838
Scotland, John, Factor to Lord Douglas	1835
Scott, Alexander, of Knockhill, Billholm, Langholm	1839
Scott, Alexander, Kinninghall	1842
Scott, Alexander, Craiglockhart	1844
Scott, Carteret G., of Malleny	1842
Scott, Charles, Merchant, Greenock	1831
Scott, David, of Bengal Civil Service	1823
Scott, Colonel George, Malleny	1842
Scott, Captain George, of Wooden	1844
Scott, Lieutenant-Colonel George, Edinburgh	1821
Scott, James, of Brotherton	1805
Scott, James Fitzmaurice, of Commieston	1843
Scott, John, of Hawkhill, Merchant, Greenock	1826
Scott, John, of Teviot Bank, W.S.	1842
Scott, Captain Robert, H.E.I.C. Naval Service	1841
Scott, Thomas Rennie, Factor to Lord Douglas	1827
Scott, Thomas, of Beechwood	1843
Scott, Thomas M'Millan, younger of Wauchope, W.S.	1843
Seller, Patrick, of Acharn	1818
Shairp, Major Norman, of Houston	1823
Shand, John, W.S.	1844
Shand, Robert, Advocate, Aberdeen	1840
Shand, William, late of Arnhall	1827
Sharp, Thomas, Manufacturer, Paisley	1839
Sharpe, General M., of Hoddam	1830
Shawe, R. F. of Brantinghame Thorpe, near Hull	1838
Shaw, Charles, Sheriff-Substitute in Skye	1835
Shaw, David, Ayr	1836
Shaw, Duncan, Factor to Lord Macdonald in Uist	1815
Shaw, Captain, George, Culblair	1839
Shaw, Patrick, Advocate	1835
Shearer, James, retired Surveyor, G. P. Office	1800
Shepherd, James, W.S.	1828
Sheriff, Charles, Sheriff-Substitute, Dunfermline	1829
Sheriff, David, Barnyards	1837
Sim, Adam, of Coulter Mains	1836
Sim, William, Tacksman of Drummond	1839
Simson, Alexander, Leith	1828
Simson, George, younger of Pitcorthie	1841
Simpson, Alexander, Helmsdale	1821
Simpson, Alexander Horatio, Paisley	1830

	Admitted
Simpson, Robert, of Cobairdy	1839
Simpson, William, of Glenythan, Procurator Fiscal for Aberdeenshire	1835
Sinclair, Alexander, late Madras Civil Service	1839
Sinclair, Dugald, Kilchamaig	1826
Sinclair, James, of Forss	1830
Sinclair, John, of Barrock	1824
Sinclair, John, of Lochaline	1834
Sinclair, John, of Redcastle	1837
Sinclair, John, Inverhagcraig, Tyndrum	1845
Sinclair, Robert, Merchant, Greenock	1826
Sinclair, William, James John Alexander, of Freswick	1843
Sitwell, William, Dunmore Park, Stirlingshire	1845
Skelton, George, of Invernettie Lodge	1837
Skene, George, younger of Rubislaw, Advocate	1831
Skene, Patrick George, of Hallyards	1825
Skene, William F., W.S.	1831
Skinner, C. G. Macgregor, Belfast, late Captain 1st Dragoon Guards	1823
Skinner, James, at Drumin, Factor to the Duke of Richmond	1827
Sligo, George, of Seacliffe	1827
Sligo, John, of Carmyle	1827
Small, David, Writer, Dundee	1843
Small, Patrick, of Dirnanean	1826
Small, William, Merchant, Dundee	1843
Smith, Alexander, of Glenmillan, Advocate, Aberdeen	1822
Smith, Archibald, younger of Carbeth-Guthrie, Advocate	1838
Smith, Charles Hope Johnstone, Garden Architect, Edinburgh	1836
Smith, David, W.S.	1833
Smith, Donald, Banker, Glasgow	1844
Smith, Eaglesfield Bradshaw, of Blackwood House	1839
Smith, George Moffat, Surgeon, R.N.	1829
Smith, George Campbell, Land Surveyor, Banff	1837
Smith, George, Distiller, tenant of Minmore and Castleton	1839
Smith, James, of Jordanhill	1823
Smith, James, late of Deanston	1821
Smith, James, of Craigend	1845
Smith, James, Architect, Glasgow	1838
Smith, James, of Olrig, Caithness	1839
Smith, James Graham, Craigend	1845
Smith, John, of Craigend	1845
Smith, John, of Crutherland	1838
Smith, John, of Birkenshaw, Renfrewshire	1839
Smith, John, Factor for Lord Douglas, Harecraig, Dundee	1843
Smith, Robert, Stafford Street, Edinburgh	1839

	Admitted
Smith, Thomas, Banker, London	1798
Smith, Thomas, at Penfillan	1834
Smith, William, of Carbeth-Guthrie	1823
Smythe, Robert, of Methven	1840
Smyth, Robert Gillespie, of Gibliston	1834
Smollett, Alexander, of Bonhill, M.P.	1826
Somerville, Samuel, of Amphorlaw, M.D., Edinburgh	1841
Somerville, Thomas, of Greenfield	1845
Sommerville, James, Merchant, Glasgow,	1838
Souter, Francis George, Durn House, Banffshire	1840
Spear, Robert, Merchant, Glasgow	1838
Spear, Thomas, Merchant, Glasgow	1838
Speid, James, of Forneth	1843
Speid, Robert, of Ardovie	1819
Speirs, Alexander, of Elderslie	1838
Speirs, Graham, Advocate, Sheriff of Edinburghshire	1836
Speirs, Thomas Dundas, Elderslie	1838
Spens, William, Manager of the Scottish Amicable Assurance Society, Glasgow	1845
Spottiswoode, John, of Spottiswoode	1812
Spottiswoode, John Brodie, of Muiresk	1834
Sprot, James, of Spot	1830
Sprot, John, Rutland Square, Edinburgh	1830
Sprot, Mark, of Garnkirk	1820
Sprot, Mark, of Riddell	1830
Sprot, Thomas, W.S.	1826
Stables, William Alexander, of Park	1836
Stainton, Joseph, of Biggarshiels	1844
Stavert, Thomas, of Hosecoat	1827
Steele, William, Advocate	1828
Stein, Charles, of Hattonburn	1837
Stephen, Moses, of Bellahouston, Advocate	1832
Stephens, Henry, Redbrae Cottage, Bonnington	1826
Stevenson, Alexander, S.S.C.	1813
Stevenson, Alexander, Banker, Langholm	1839
Stevenson, Duncan, Printer to the University of Edinburgh	1824
Stevenson, Captain Hugh, late Argyleshire Militia	1805
Stevenson, John, Oban	1842
Stevenson, Nathaniel, of Braidwood	1838
Stevenson, Robert, Civil-Engineer, Edinburgh	1807
Stevenson, Thomas, Merchant, Leith	1831
Steuart, Andrew, of Auchlunkart	1845
Steuart, Alexander, of Dercullich	1805
Steuart, Archibald Seton, Alloa	1835
Steuart, Claude Scott, 23 Portland Place, London	1843
Steuart, James, W.S.	1842
Steuart, William, of Glenmoriston	1833

	Admitted
Stewart, Alexander, of Glencribisdale	1839
Stewart, Charles, Solicitor, Inverness	1840
Stewart, Charles, of Ardsheal	1794
Stewart, Charles, of Hillside	1823
Stewart, Charles, at Chesthill	1834
Stewart, David, 94 Great Russell Street, Bloomsbury, London	1842
Stewart, Donald, Luskintyre	1817
Stewart, Captain Dugald	1799
Stewart, George, Kirkchrist, Kirkcudbright	1844
Stewart, George Drummond, of Braco Castle	1838
Stewart, Henry, of St. Fort	1837
Stewart, Henry Black, of Balnakieley	1838
Stewart, Captain Houston, of Gart, R.N.	1822
Stewart, James, Tacksman of Deskie and Delmore	1839
Stewart, James, Merchant, Greenock	1825
Stewart, James Hope, of Gillenbie	1838
Stewart, John, of Belladrum	1819
Stewart, John, of Dalguise	1823
Stewart, John, of Findynate, M.D., R.N.	1839
Stewart, John, of Fasnacloich	1817
Stewart, John, of Binny	1809
Stewart, John, of Crossmount	1801
Stewart, John, of Achadashenaig	1824
Stewart, John Lorn, of Glenbuckie	1824
Stewart, John, Gabroch Hill, Glasgow	1845
Stewart, John Henry Fraser, yr. of Belladrum, H. M. 24th Regiment	1843
Stewart, Major Ludovic, Pittyvaich	1806
Stewart, Mark S., of Southwick	1837
Stewart, Patrick Maxwell, M.P., Merchant, London	1813
Stewart, Patrick G., Agent for the Bank of Scotland, Perth	1829
Stewart, Robert, of Ardvorlich	1823
Stewart, Robert, of Stewarthall	1825
Stewart, Robert, of Carfin, W.S.	1833
Stewart, Robert, of Parsons' Green	1844
Stewart, Samuel M'Dowall, 31 Buchanan Street, Glasgow	1845
Stewart, Stair H., of Physgill	1828
Stewart, William, Sheriff-Clerk, Kincardineshire	1825
Stewart, William, Ballaterach, Ballater	1829
Stewart, William, Blackhouse, Largs	1844
Stirling, General A. Graham, of Duchray and Auchyle	1801
Stirling, Alexander Gartshore, of Craigbarnet	1818
Stirling, Sylvester Douglas, of Glenbervie	1837
Stirling, John, of Kippendavie	1833
Stirling, J. D. Morris, of Blackgrange	1841
Stirling, Thomas Graham, of Strowan	1839

	Admitted
Stirling, William, of Content	1823
Stirling, William, younger of Keir	1841
Stirling, William Moray, of Abercairny	1825
Stocks, David, of Invernyte	1836
Stocks, James, Land Surveyor, Kinross	1837
Stodart, George Tweedie, of Oliver, W.S.	1839
Stodart, John, Cartland Mains	1829
Stoddart, Alexander, of Ballendreck	1829
Stott, Gibson, of Balloch Castle	1832
Strang, William, Lopness, Orkney	1819
Straton, George Thomas, of Kirkside	1842
Stronach, John, Fife Keith	1823
Stronach, William, Ardmellie, Royal Engineers	1840
Stuart, Alexander, of Laithers	1835
Stuart, Charles, of Ballahulish	1827
Stuart, James, S.S.C.	1822
Stuart, Captain John, of the Princess of Wales Excise Yacht	1809
Stuart, Peter, Merchant, Glasgow	1845
Sturrock, John, Banker, Dundee	1843
Sutherland, Captain George Mackay, of Udoll	1832
Sutherland, James, Distiller, Tacksman of Aldourie	1839
Sutherland, William, Farmer at Ulbster, Caithness	1839
Swinburne, Colonel T. R., of Marcus	1843
Swinton, Archibald, Advocate, Professor of Civil Law, Edinburgh	1841
Swinton, George, late Chief Secretary to the Supreme Government of India	1834
Swinton, John, Inverleith Place	1810
Syme, James, Professor of Clinical Surgery, University of Edinburgh	1838
Symers, Colin, of Kingskettle, Collector of Customs, Dundee	1843
Symers, John, Banker, Dundee	1843

T

† Tweeddale, Most Noble George, Marquis of, K.T.	1809
Traquair, The Right Honourable Charles, Earl of	1811
Talbot, The Right Honourable John, Earl of, K.P. Honorary Member	1827
Torphichen, The Right Honourable James, Lord	1821
Thriepland, Sir Patrick Murray of Fingask, Bart.	1824
Tait, Captain Alexander, of Milrig	1845
Tait, George, Advocate	1808
Tait, John, Advocate, Sheriff of Kinross and Clackmannan	1834
Taitt, George, of Langrig	1825
Tawse, Andrew, W.S.	1836

	Admitted
Tawse, John, Advocate, Secretary to the Society for Propagating Christian Knowledge	1825
Tayler, Major Alexander Francis, Rothiemay House	1814
Taylor, Robert, of Kirktonhill	1837
Taylor, William, Merchant, Leith	1828
Tennant, John, of St. Rollox	1833
Tennant, Charles J., St. Rollox, Glasgow	1838
Tennant, Hugh, of Well Park, Glasgow	1838
Thom, Robert, of Ascog	1818
Thom, Robert, yr. of Ascog	1844
Thoms, Peter, Merchant, Dundee	1843
Thoms, Alexander, of Rumgay	1842
Thoms, John, Factor on the Estate of Keir	1843
Thomson, Alexander, of Banchory	1821
Thomson, Alexander, Banker, Greenock	1825
Thomson, Alexander, of Whiteriggs	1838
Thomson, Arthur, Agent for Bank of Scotland at Aberdeen	1841
Thomson, George, of Burnhouse, Advocate	1836
Thomson, James, Kimmerghame Mains	1828
Thomson, John, Bookseller, Edinburgh	1811
Thomson, John, Craigie	1836
Thomson, John, Charlotte Square, Edinburgh	1833
Thomson, John, Agent for Commercial Bank, Inverness	1839
Thomson, Peter, Hangingside	1838
Thomson, Robert, Advocate, Sheriff of Caithness	1835
Thomson, Thomas, Advocate, Principal Clerk of Session	1807
Thomson, William, of Woodhouse	1828
Thomson, William, of Pleasance	1843
Thomson, William, Charlotte Square, Edinburgh	1844
Thomson, William Thomas, Manager Standard Assurance Company, Edinburgh	1841
Thorburn, Kenneth M'K., W.S.	1842
Threshie, David Scott, W.S.	1824
Threshie, Robert, of Barnbarroch	1835
Timins, William, of Hillfield, Stanmore, Middlesex	1844
Tod, Hugh, W.S.	1817
Tod, John, of Kirkhill, W.S.	1838
Tod, Peter, of Meikleholmside	1829
Tod, Peter, Burican, Arran	1844
Tod, John, of Finnich Mellise, Dumbarton	1838
Torrance, George Mackmikin, of Threave	1827
Torrance, Thomas, Meadowhead	1831
Torrance, William, Gilmerton	1831
Torrie, Thomas Jameson, Advocate	1837
Traill, George, of Ratter, M.P.	1822
Traill, George William, of Viera, &c., Hanover Square, London	1840

	Admitted
Traill, Thomas Stewart, M.D., Professor of Medical Jurisprudence in the University of Edinburgh	1834
Traill, William, of Woodwick, Orkney	1821
Trotter, Charles, Regent Terrace	1841
Trotter, Captain Robert Knox, of Ballindean	1829
Trotter, John P. Advocate, Sheriff-Substitute, Dumfries	1831
Trotter, Richard, of Mortonhall	1836
Trotter, Thomas, W.S.	1828
Turnbull, Archibald, of Bellwood	1826
Turnbull, George, of Abbey St. Bathans, W.S.	1833
Turnbull, John, yr. of Abbey St. Bathans, W.S.	1844
Turnbull, John, Spittal	1842
Turnbull, Joseph, Bonhill Place, Dumbarton	1838
Turnbull, Phipps, Crooks	1841
Turner, Geo. of Menie, Lieut.-Col. Royal Horse Artillery	1828
Turner, William, Surgeon, Greenock	1831
Tytler, James, of Woodhouselee	1840
Tytler, William Fraser, of Balmain and Burdsyards, Sheriff of Inverness-shire	1802
Turner, Angus, Town-Clerk, Glasgow	1844
U	
Unwin, William Heathcot, Allean Cottage, Pitlochry	1839
Ure, James, Maryborough, Ross-shire	1839
Urquhart, Beauchamp Colclough, of Byth and Meldrum	1834
Veitch, James, of Elliock	1822
Veitch, John, of Woodside	1833
Vere, Daniel, Advocate	1807
W	
WELLINGTON, Field-Marshal His Grace Arthur, Duke of, K.G., &c. Honorary Member	1815
†WEMYSS and MARCH, The Right Hon. Francis, Earl of	1793
†WILLOUGHBY DE ERESBY and GWYDIR, The Right Hon. P. Drummond Burrell, Lord	1808
WARD, Right Hon. William, Lord	1843
WESTERN, The Right Hon. John, Lord, Honorary Member	1837
WALPOLE, The Hon. Henry, of Woolerton Park	1845
WARRENDER, The Right Hon. Sir George, of Lochend, Bart.	1804
WOOD, Commissary-General Sir Gabriel, Knight	1830
Waddell, George, of Ballochnie, W.S.	1824
Waddell, William, of Easter Moffat, W.S.	1818
Waldie, John, Kelso	1824
Waldie, John, of Henderside	1826
Walker, Bethune James, of Fallfield	1835

	Admitted
Walker, James Suttie, Fintray	1835
Walker, James, of Dalry, Sheriff of Wigtonshire	1835
Walker, John, of Crawfordton	1834
Walker, Robert, Ferrygate	1834
Walker, Robert, Lathamhill, Barony	1844
Walker, Dr. Thomas, of Polmont Bank	1843
Walker, William S., of Bowland	1835
Walkinshaw, Daniel, Merchant, Glasgow	1838
Wallace, Captain Patrick, late Provost of the City of St. Andrews	1841
Wallace, Patrick, Coach-Builder to Her Majesty for Scotland	1842
Wallace, Robert, of Kelly, M.P.	1825
Wallace, William, of Auchinvolve	1844
Ware, Dr. Samuel Hibbert, of Hall Barns, Altringham, Cheshire	1840
Warner, Patrick, of Ardeer	1841
Wason, Rigby, of Mayfield	1836
Waters, James, Collector of the Customs, Wick	1839
Waterston, Charles, Manager of the Caledonian Banking Company, Inverness	1839
Watson, Alexander, Banker, Granton	1842
Watson, Henry George, Accountant, Edinburgh	1841
Watson, Hugh, Keillor Farm	1828
Watson, John, Manager of the Edin. Gas Light Company	1825
Watson, Robert, Town-Clerk, Forres	1841
Watson, William, of Burnhead	1841
Watson, William Dickson, late of Press	1810
Watt, James, of Crawfordsdyke	1825
Watt, Robert, Factor on the estates of Closeburn and Mansfield	1835
Wauchope, Andrew, of Niddrie Marischall	1840
Wauchope, John, of Edmonstone	1842
Wauchope, George, Moray Place	1824
Webster, Alexander, Advocate, Aberdeen	1840
Webster, John, Factor for W. F. Campbell, Esq. of Islay, on the Estate of Woodhall	1839
Webster, William, Factor to W. F. Campbell, Esq. of Islay	1838
Wedderburn, David, of Pearsie	1831
Wedderburn, Frederick S., of Birkhill	1844
Weir, Thomas, of Bogangreen	1835
Welsh, David, of Collin, W.S.	1830
Welsh, James, at Earlshaugh	1826
Welsh, John, Sheriff-Clerk of Peeblesshire	1833
Welsh, Robert, of Mossfennan	1840
Wemyss, James Erskine of Wemyss, Captain R.N., M.P.	1823
Wemyss, James, of Wemysshall	1841
Wetherell, William, Land-Agent, Durham	1836

	Admitted
Whigham, Robert, of Lochpatrick, Advocate, Sheriff of Perthshire	1827
White, Alexander, of Fens, Merchant, Leith	1829
White, Henry W., of Monar	1842
White, James, Merchant, Leith	1842
White, John, of Netherurd	1842
White, Peter, Accountant in Glasgow	1838
White, William, late of Gibraltar, Merchant, Glasgow	1838
White, Robert, W.S.	1842
Whitehead, Joseph, yr. of Kilnside	1845
Whitton, Andrew, of Couston	1843
Whyte, Thomas, of Glenesslin	1829
Wightman, James Seton, of Courance	1827
Wilkie, Duncan, Kirriemuir	1843
Wilkie, Major James, of Newbarns	1836
Wilkie, John, of Foulden	1830
Wilkie, William, of Ormistonhill	1824
Williamson, Charles Alexander, of Balgray	1833
Williamson, David, W.S.	1838
Williamson, Lieut.-Col. David, late of the 92d Regiment	1826
Williamson, James, of Cardrona	1842
Williamson, John W., of West Green, Agent for the British Linen Company, Kinross	1829
Wilson, Alexander, Kilnhillock, Banffshire	1842
Wilson, Francis Johnstone, of Stroquhan	1843
Wilson, George, M.D., Lecturer on Chemistry	1845
Wilson, James, Agent at Inverness for the Commercial Bank of Scotland	1840
Wilson, James, Corn Merchant, Dundee	1843
Wilson, James, Virginia Street, Glasgow	1844
Wilson, John, of Auchineden	1835
Wilson, John, of Thornly	1830
Wilson, John, Professor of Moral Philosophy in the University of Edinburgh	1835
Wilson, John, Barganey, Factor to the Duchesse de Coigny	1835
Wilson, John, of Arden	1843
Wilson, John, younger of Arden	1843
Wilson, John, of Cumledge	1841
Wilson, John, Tochieneal, Factor for the Earl of Seafield	1842
Wilson, Peter, W.S., Wick	1841
Wilson, Robert Sym, Cashier of the Royal Bank of Scotland	1841
Wilson, William, Factor for the Earl of Glasgow	1804
Wilson, William, of Campbellfield	1843
Wilson, William Rea, of Kelvinbank	1807
Wilsone, George Ross, of Benmore	1826
Wingate, Andrew, Merchant, Glasgow	1838
Woddrop, John Allan, of Dalmarnock	1840

	Admitted
Wood, John, Factor on the Estate of Balcarras	1835
Wood, J. Stewart, Coates Crescent, Edinburgh	1844
Wood, William, Merchant, Leith	1828
Wood, William Collins, of Keithock	1841
Woodburn, William, Commissioner on the estates of Nithsdale and Terregles	1829
Wooly, Richard, late of Wester Dalry	1821
Wright, Major-General, Royal Engineers	1833
Wright, James, of Lawton	1817
Wright, James, St. Vincent Street, Glasgow	1839
Wright, Thomas Guthrie, Auditor, Court of Session	1824
Wyld, James, of Gilston	1802
Wylie, David, Circuit-Clerk of Justiciary, Edinburgh	1825
Wylie, James, Factor for the Marquis of Breadalbane	1833

Y

Yeats, William, yr. of Aquharney, Advocate, Aberdeen	1838
Yorstoun, William Grierson, of Garroch	1828
Young, Harry, of Cleish	1842
Young, James, Land-Surveyor, Pitfour	1841
Young, Samuel D., late of Gullyhill	1826
Young, William, W.S.	1821
Yuille, Andrew Buchanan, of Darleith	1838
Yule, John, Factor to Sir James Graham of Netherby, Bart., M.P.	1828
Yule, Captain Patrick, Royal Engineers	1827

Z

ZETLAND, The Right Hon. Thomas, Earl of	1840